APPLICATION TO RENEW A PERMIT TO OPERATE A CLASS V LANDFILL

Prepared for:

NIELSON CONSTRUCTION

Nielson Construction Landfill

Emery County, Utah

Prepared by

IGES, INC.

4153 Commerce Drive

Salt Lake City, Utah 84107

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INTRODUCTION

This document presents an application to renew a permit to operate solid waste disposal facilities at the Nielson Construction Landfill (Nielson Landfill) which is owned and operated by Nielson Construction. The Nielson Landfill is currently operated under permit number 9806R1 issued by the Utah Solid and Hazardous Waste Control Board. This permit became effective on November 1, 2002 and expires at midnight on October 31, 2007.

In the five and one half years that have passed since the current permit was issued for the Nielson Landfill, very few changes have taken place other that the annual volume of wastes.

This permit application contains conceptual level engineering sufficient for permitting purposes. This permit application does represent a lateral expansion to the currently permitted landfill area on land owned by Nielson Construction.

The following items, which have been previously permitted and are part of the operating record of the landfill, will not be discussed in great detail in this permit application:

- Alternate Liner – an alternate liner consisting of the low-permeability site soils has been approved for use as a landfill liner at the Nielson Landfill. All future landfill cells will be constructed using the previously approved alternate liner.

- Leachate collection and removal system Exemption – due to unique site conditions, the Nielson Landfill has been exempted from the incorporation of a leachate collection and removal system. All future landfill cells will be constructed without leachate collection and removal systems.

- Groundwater Monitoring Exemption – due to the extreme depth of ground water and the Mancos shale formations, the Nielson Landfill has been exempted from the UDEQ groundwater monitoring requirements.

- Alternate Final Cover – due to the approval of an alternative landfill liner, an alternative final cover has also been approved. Nielson Landfill plans to utilize the previously approved alternative cover.

The application has been organized to follow the general outline of R315-302 and R315-310. This organization results in some duplication and repetition of information, but it is intended to simplify the review and approval of the permit application. Part I of this document duplicates the standard form outlining general data pertaining to the site. Part II is a general report that includes a facility description, landfill operations plan, and closure and post-closure care plans and financial assurance. Part III is the Professional Engineering Report and includes details on the design and geohydrology of the site.

Utah Class I and V Landfill Permit Application Form

Part I General Information APPLICANT: PLEASE COMPLETE ALL SECTIONS.

I. Landfill Type		II. Application Type		
☐ Class I ☒ Class V		☐ New Application ☒ Renewal Application		☒ Facility Expansion ☐ Modification

For Renewal Applications, Facility Expansion Applications and Modifications Enter Current Permit Number _____

III. Facility Name and Location

Legal Name of Facility: Nielson Construction Landfill

Site Address (street or directions to site): 3.1 Miles North of SR29 on DesBee Dove Road

County: Emery

City	State	Zip Code	Telephone
Castle Dale	UT	84513	435-687-2494

Township	Range	Section(s)	Quarter/Quarter Section	Quarter Section
18S	8E	16		

Main Gate Latitude 39 degrees 15 minutes 32 Sec N seconds | Longitude degrees 111 minutes 1 seconds 29 W

IV. Facility Owner(s) Information

Legal Name of Facility Owner: Nielson Construction

Address (mailing): P.O Box 620

City	State	Zip Code	Telephone
Huntington	UT	84528	435-687-2494

V. Facility Operator(s) Information

Legal Name of Facility Operator: Nielson Construction

Address (mailing): P.O Box 620

City	State	Zip Code	Telephone
Huntington	UT	84528	435-687-2494

VI. Property Owner(s) Information

Legal Name of Property Owner: Same As Above

Address (mailing):

City	State	Zip Code	Telephone

VII. Contact Information

Owner Contact: James L. Davis		Title: Environmental Manager	
Address (mailing): P O. Box 620			
City: Huntington	State: UT	Zip Code: 84528	Telephone: 435-687-2494
Email Address: jamesdavis@nielsonconstruction.com		Alternative Telephone (cell or other)	435-749-9036
Operator Contact: Same As Above		Title	
Address (mailing):			
City	State	Zip Code	Telephone
Email Address		Alternative Telephone (cell or other)	
Property Owner Contact: Same As Above		Title	
Address (mailing):			
City	State	Zip Code	Telephone
Email Address		Alternative Telephone (cell or other)	

Utah Class I and V Landfill Permit Application Form

Part I General Information (Continued)

VIII. Waste Types (check all that apply)

☐ All non-hazardous solid waste (see R315-315-7(3) for PCB special requirements) **OR** the following specific waste types:

Waste Type	Combined Disposal Unit	Monofill Unit
☐ Municipal Waste	☐	☐
☒ Construction & Demolition	☒	☐
☒ Industrial	☒	☐
☐ Incinerator Ash	☐	☐
☐ Animals	☐	☐
☐ Asbestos	☐	☐
☐ PCB's (R315-315-7(3) only)	☐	☐
☒ Other Mine	☒	☐

IX. Facility Area

Facility Area..... 40 acres

Disposal Area..... 30 acres

Design Capacity

Years..... 200

Cubic Yards..... 1 mil cubic yards

Tons..... 500,000

X. Fee and Application Documents

Indicate Documents Attached To This Application

☒ Application Fee: Amount $ 100

☒ Facility Map or Maps ☒ Facility Legal Description ☒ Plan of Operation ☒ Waste Description

☒ Ground Water Report ☒ Closure Design ☒ Cost Estimates ☒ Financial Assurance

Class V Special Requirements

☐ Documents required by UCA 19-6-108(9) and (10)

I HEREBY CERTIFY THAT THIS INFORMATION AND ALL ATTACHED PAGES ARE CORRECT AND COMPLETE.

Signature of Authorized Owner Representative James L. Davis Name typed or printed	Title: Environmental Address: P.O Box 620 Huntington, UT 84528	Date: 5-14-08
Signature of Authorized Land Owner Representative (if applicable) Name typed or printed	Title Address	Date
Signature of Authorized Operator Representative (if applicable) Name typed or printed	Title Address	Date

APPLICATION TO RENEW A PERMIT TO OPERATE A CLASS V LANDFILL

Nielson Construction Landfill

PART I - GENERAL DATA

APPLICATION TO RENEW A PERMIT TO OPERATE A CLASS V LANDFILL

Nielson Construction Landfill

PART II - GENERAL REPORT

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1.0 - FACILITY DESCRIPTION

Nielson Construction owns and operates the Nielson Construction Landfill (NCL) located approximately 3.1 miles North of S.R. 29 off from 550 west north of Castledale, Utah. The landfill is a Class V landfill (commercial nonhazardous solid waste) disposal facility managed by Nielson Construction and is used primarily for the disposal of coal mine related wastes. The landfill has been operated by Nielson Construction since purchasing the site from D&R Salvage. The NCL has been in operation since 1986 and is currently operating under Utah State Department of Environmental Quality Permit Number 9806R1. The facility is entirely fenced, with public access through the locking gate at the main entrance.

The NCL is located in Section 16 of Township 18 South, Range 8 East, Salt Lake Base and Meridian. Drawing 1 (Appendix A) illustrates the location of the NCL. The landfill site consisting of approximately 30 acres is bounded on all sides by Nielson Construction owned properties available for future use.

1.1 AREA SERVED

The NCL is the only active Class V landfill in Emery County and serves primarily the coal mining industry in western Emery County.

1.2 WASTE TYPES

The landfill takes in an average of approximately 12 tons per day of waste. Mine waste (timbers, brattice, concrete blocks, wood and metal materials, empty lubricant containers and general mine refuse) constitutes the majority of the waste coming into the landfill. The landfill may also dispose of nonhazardous construction and demolition waste, yard waste, inert waste, and waste tires. Appliance and car bodies may be stored for recycling. Recycling activities are performed by Nielson Construction employees.

The landfill will not accept conditionally exempt small quantity generator hazardous waste.

1.3 HOURS OF SITE OPERATION

The NCL is open to the contractors for waste disposal Monday through Thursday from 8:00 a.m. to 5:00 p.m. The landfill maintains these hours year round. The facility is closed on New Year's Day, 4th of July, Thanksgiving and Christmas.

Nielson personnel control public access to the landfill to prevent illegal dumping of wastes, public exposure to hazards, scavenging, and unauthorized traffic. Access control is a key element in preventing unauthorized scavenging or injury. Fences, locked gates, and natural barriers provide the basis of the site's access control system. During operating hours, Nielson personnel monitor and control all access to facilities with at least one person on-site during all operational hours.

1.4 PERSONNEL

The following persons are responsible or available for on-site operations for the NCL:

Landfill Supervisor - The Landfill Supervisor is responsible for planning and construction of the landfill facility and overall operation of the solid waste management system. The Landfill Supervisor also ensures that the facility is in compliance with the conditions of the permit issued by the State of Utah Department of Solid and Hazardous Waste (DSHW) through regular inspections and monitoring. The Landfill Supervisor oversees the production of annual environmental and financial reports. All landfill personnel report to the Landfill Supervisor.

To fulfill these responsibilities adequately, the LS must have six to eight years of heavy equipment operation, with a minimal of five years supervisory experience. College training may be applied toward years of experience at the discretion of the Nielson Construction management.

Waste Screener – The Waste Screener(s) are responsible for visual inspections of incoming loads, helping the Equipment Operators with random waste screening, logging vehicles, record keeping, traffic control and clean up of litter. The Waste Screener(s) are typically at the entrance to the landfill property controlling site access.

Nielson Construction maintains at least one person at the gate to inspect incoming loads during all hours of operation. The Waste Screener(s) provide assistance to the Landfill Supervisor as requested.

Equipment Operator - The Equipment Operators are responsible for the periodic compaction and placement of the waste at the working face. Responsibilities include all aspects of waste placement and compaction, maintaining site access and landfill geometry, and placement of soil cover. The Equipment Operators provide assistance to the Landfill Supervisor as requested.

1.5 EQUIPMENT

The following equipment is currently on-site for routine operation of the landfill:

Cat D966 Loader
Cat D8K Dozer
Cat Backhoe

Nielson Construction will provide and operate other equipment on an as-needed basis for ongoing landfill activities.

2.0 - LEGAL DESCRIPTION

The legal description of the landfill property owned by Nielson Construction is:

> Beginning 660 feet east of the northwest corner of SE 1/4 NE 1/4, section 16, township 18 south, range 8 east, Salt Lake Baseline and Meridian; thence east 660 feet; thence south 1320 feet; thence west 1320 feet; thence north 660 feet; thence east 660 feet; thence north 660 feet point of beginning.
>
> With a 50 foot right of way being described as follows:
> Beginning at the northwest corner of SE 1/4 NE 1/4 section 16, township 18 south, range 8 east Salt Lake Baseline and Meridian; thence east 660 feet; thence south 50 feet; thence west 610 feet; thence south 610 feet; thence west 50 feet; thence north 660 feet to point of beginning.

The landfill entrance gate is located at latitude 39 degrees 15 minutes 32 seconds North, Longitude 111 degrees 1 minute 29 seconds West.

2.1 Proof of Ownership

Deeds indicating proof of ownership are included in Appendix B.

2.2 Land Use and Zoning of Surrounding Areas

The NCL operation is consistent with all land use and zoning restrictions in effect in Emery County. The area surrounding the landfill is zoned for mining and grazing.

3.0 - OPERATIONS PLAN

This Operations Plan has been written to address the requirements of UAC R315-30202 and briefly describes the planned operations at the NCL. The purpose of the Operations Plan is to provide the Landfill Supervisor, Waste Screeners and Equipment Operators with standard procedures for day-to-day operation of the landfill. A copy of this manual will be kept on file at the landfill. Forms to be utilized by landfill personnel are included in Appendix C.

3.1 SCHEDULE OF CONSTRUCTION

The development of the NCL has been presented in three Phases. The expansion of the existing landfill eastward will constitute Phase I. The landfill will then begin expanding to the north approximately 200 feet with the final Phase (Phase III) expanding another approximately 600 feet north along the eastern boundary of the landfill property. Construction of the landfill site will be made according to the general layout presented in the drawings 3, 4, and 5 (Appendix A). The proposed configuration was developed based on geologic/hydrogeologic conditions, geotechnical considerations and the previously defined landfill boundary.

The remaining capacity of the landfill is approximately 200 years of disposal based on available fill volume, expected daily waste disposal rates, and an in-place density of 1,000 pounds per cubic yard (ppcy).

3.2 DESCRIPTION OF HANDLING PROCEDURES

3.2.1 General

The landfill is open for commercial disposal only. A sign is posted near the landfill entrance that indicates the following information:

Types of wastes that are accepted
Types of wastes not accepted
Emergency telephone numbers
Hours and days of landfill operation

All vehicles delivering wastes to the site must stop at the Waste Screeners' trailer. NCL reserves the right to refuse service to any suspect load. No open burning is allowed. No smoking is allowed near the work face.

The operation of the landfill is documented on various forms. The forms that Nielson personnel use to help maintain an orderly processing of waste while minimizing the potential for environment impacts are:

Daily Log
Inspection Form
Equipment Checklist
Random Load Inspection Record

Copies of all forms are included in Appendix C.

3.2.2 Waste Acceptance

Nielson personnel utilizes the Daily Log to track all material delivered to the landfill and serves as the basis for all billing. The Daily Log includes information on hauler's name, vehicle license number, time, weight, description of waste, and initials of the Waste Screener filling out the form.

The Waste Screener will inquire as to the contents of each incoming load to screen for unacceptable materials. Any vehicle suspected of carrying unacceptable materials (liquid waste, sludges, or hazardous waste) will be prevented from entering the disposal site unless the driver can provide evidence that the waste is acceptable for disposal at the site. The Waste Screener directs each vehicle to the scale to obtain the vehicles entrance weight; then the vehicle proceeds to the working face and discharges the load. Each vehicle is weighted after discharging the load to determine the weight of waste delivered.

Vehicles carrying unacceptable materials will be required to exit the site without discharging their loads. If a load is suspected of containing unacceptable materials; the Waste Screener will then further inspected the load as it is discharged at the landfill tipping area.

Loads will be regularly surveyed at the tipping area. If a discharged load contains inappropriate or unacceptable material, the discharger will be required to reload the material

and remove it from the landfill site. If the discharger is not immediately identified, the area where the unacceptable material was discharged will be cordoned off. The unacceptable material will be moved to a designated area for identification and preparation for proper disposal.

Each load is visually inspected. Waste screening is done as needed or scheduled according to the procedures outlined in Section 3.3 Waste Inspection.

3.2.3 Waste Disposal

Wastes are dumped at the toe of the work face when possible and spread up the slope in one to two foot lifts, keeping the slope at three to one (horizontal to vertical) configuration. Working face dimensions are kept wide enough to safely accommodate the vehicles bringing waste into the landfill.

Typically the dozer or loader is operated with the blade facing uphill. Equipment operations across the slope are avoided to minimize the potential of equipment tipping over. In addition to safety concerns, a toe of slope to crest of slope working orientation provides the following benefits:

Increases in equipment compactive effectiveness.
Increased visibility for waste placement and compaction.
More uniform waste distribution.

Wastes are compacted by making several passes up and down the slope. Compaction reduces litter, differential settlement, and the quantities of cover soil needed. Compaction also extends the life of the site, reduces unit costs, and leaves fewer voids to help reduce vector problems. Care is taken that no holes are left in the compacted waste. Voids are filled with additional waste as they develop.

Grade stakes will be used when necessary to control cell height and top surface grade. Soil cover is applied to all areas of the active cell that will not receive additional waste within 30 days.

3.2.4 Acceptable Wastes

3.2.4.1 Appliances and Car Bodies

Appliances and car bodies are accepted at the landfill and are separated for recycling. No appliances containing refrigerants are accepted.

3.2.4.2 Construction & Demolition Waste

Nonhazardous construction and demolition (C&D) waste is accepted at the landfill.

3.2.4.3 Nonhazardous Mining Wastes

Nonhazardous mining wastes are accepted at the landfill. Nonhazardous mining wastes include timbers, brattice, concrete blocks, wood and metal materials, empty lubricant containers, and general mine refuse.

3.2.4.4 Tires

Tires are accepted in small quantities from the commercial haulers. When sufficient quantities of tires are collected, a tire hauler is called and the tires are removed from the facility for recycling.

3.2.5 Prohibited Wastes

3.2.5.1 Asbestos Waste

Asbestos waste is not accepted at the landfill.

3.2.5.2 Bulk or Containerized Liquid Waste

Bulk or containerized liquid wastes are not accepted at the landfill.

3.2.5.3 Dead Animals

Dead animals are not accepted at the landfill.

3.2.5.4 Grease pit and Animal Waste By-Products

Waste from restaurant grease traps and slaughterhouse by-products are not accepted at the landfill.

3.2.5.5 Infectious Wastes

Infectious wastes are not accepted at the landfill.

3.2.5.6 Used Oil and Batteries

Used oil and batteries are not accepted at the landfill.

3.3 WASTE INSPECTION

3.3.1 Landfill Spotting

Learning to identify and exclude prohibited and hazardous waste is necessary for the safe operation of the landfill. The Waste Screeners are required to receive initial and periodic hazardous waste inspection training (equivalent to the SWANA waste screening training).

Hazardous wastes have either physical or chemical characteristics that could harm human health or the environment. A waste is considered hazardous if it falls into either of two categories: 1) a listed waste, or 2) a characteristic waste. Hazardous wastes are not accepted at the landfill.

3.3.2 Random Waste Screening

Random inspections of incoming loads are conducted according to the schedule established by the Landfill Supervisor. One or more commercial waste loads per week are selected randomly according to the schedule. If frequent violations are detected, additional random checks are scheduled at the discretion of the Landfill Supervisor.

If a suspicious or unknown waste is encountered, the Waste Screener proceeds with the waste screening as follows:

- The driver of the vehicle containing the suspect material is directed to the waste screening area.
- The Random Load Inspection Record is completed.
- Protective gear is worn (leather gloves, steel-toed boots, goggles, coveralls, and hard hat).

- The load being inspected is spread out with the landfill equipment or hand tools and visually examined. Suspicious marking or materials, like the ones listed below, are investigated further:

    - Containers labeled hazardous
    - Material with radioactive markers
    - Material with unusual amounts of moisture
    - Biomedical (red bag) waste
    - Unidentified powders, smoke, or vapors
    - Liquids, sludges, pastes, or slurries
    - Asbestos or asbestos contaminated materials
    - Batteries
    - Other wastes not accepted by the landfill

The Landfill Supervisor is called if any of the above mentioned wastes are encountered or if unstable wastes that cannot be handled safely are discovered or suspected.

3.3.3 Removal of Hazardous or Prohibited Waste

Should hazardous or prohibited wastes be discovered during random waste screening or during tipping, the waste is removed from the landfill as follows:

- The waste is loaded back on the hauler's vehicle. The hauler is then informed of the proper disposal options.
- If the hauler or generator is no longer on the premises and the identity of the hauler is known, they are asked to retrieve the waste and informed of the proper disposal options.
- The Landfill Supervisor arranges to have the waste transported to the proper disposal site and then bill the original hauler or generator.

A record of the removal of all hazardous or prohibited wastes is kept in the Daily Log.

3.3.4 Hazardous or Prohibited Waste Discovered After the Fact

If hazardous or prohibited wastes are discovered in the landfill, the following procedure is used to remove them:

- Access to the area is restricted.
- The Landfill Supervisor is immediately notified.
- The Equipment Operator removes the waste from the working face if it is safe to do so.
- The waste is isolated in a secure area of the landfill and the area cordoned off.
- The Emery County Sheriff's Department Hazmat Response Team is notified. The Response Team physically inspects the material and provides waste handling specifics for the disposal.

The DSHW, the hauler (if known), and the generator (if known) is notified within 24 hours of the discovery. The generator (if known) is responsible for the proper cleanup, transportation, and disposal of the waste.

3.3.5 Notification Procedures

The following agencies and people are contacted if any hazardous materials are discovered at the landfill:

James Davis, Landfill Supervisor..... (435) 749-9036
Southeastern Utah Health Department..... (435) 637-3671
Director, DSHW..... (801) 538-6170
Emery Co. Sheriff's Office..... (435) 381-2404

3.4 MONITORING AND INSPECTION SCHEDULE

3.4.1 Groundwater

Nielson Construction is not required to monitor groundwater as part of the landfilling operations; therefore, no inspections or maintenance activities are required.

3.4.2 Surface Water

Drainage control problems can result in accelerated erosion of a particular area within the landfill. Differential settlement of drainage control structures can limit their usefulness and may result in a failure to properly direct storm water off-site. Drawings 8, and 9 (Appendix A) illustrates the surface water drainage control features designed to incorporate both existing

topographical features as well as changes to the overall site layout. Landfill staff will inspect the drainage system monthly. Temporary repairs will be made to any observed deficiencies until permanent repairs can be scheduled.

3.4.3 Leachate Collection

Leachate is not collected as part of the landfilling operations; therefore, no inspections or maintenance activities are required.

3.4.4 Landfill Gas

This facility does not accept municipal solid waste and is not required to monitor for explosive gasses.

3.4.5 Inspection Documentation

The results of all routine inspections of site facilities will be recorded on Landfill Inspection Form. The inspection forms will be submitted to the Landfill Supervisor for inclusion in the landfill operating records as required in Section R315-302-2(5) of the Rules. Copies of all landfill forms utilized to document landfilling activities are included in Appendix C.

3.5 CONTINGENCY AND CORRECTIVE ACTION PLANS

The following sections outline procedures to be followed in case of fire, explosion, ground water contamination, release of explosive gases, or failure of the storm water management system. Emergency communication will be primarily by either hard-wired telephones or cell phones.

3.5.1 Fire

3.5.1.1 Incoming Waste/ Incoming Vehicle Fire

The potential for fire is a concern in any landfill. The NCL follows a waste handling procedure to minimize the potential for a landfill fire. If any load comes to the landfill on fire, the vehicle will be directed to a designated section of the landfill, away from any exposed waste, and allowed to deposit the material. The designated area will vary depending on operational areas in use. The area will be readily accessible and within 1 or 2 minutes of the

tipping area. The designated area will be isolated from the existing tipping area and will either be an excavated area with no underlying fill or at a location with a minimum of 1 foot of soil cover over underlying fill. In no case will a load thought to be burning be allowed to be dumped in the landfill.

Once burning waste is removed from the vehicle, the application of cover soil by landfill earth-moving equipment or the application of water by an off-site water truck to extinguish the fire can be carried out. Smothering the fire with soil is the preferred method. If, at any time, additional assistance is required, local fire-fighting units will be contacted. Once the burning waste cools and is deemed safe, the material is then incorporated into the working face.

3.5.1.2 Ground Fire/Below Cover Fire

In the event that waste placed on the ground or waste that was previously covered erupts into fire, the material will be isolated from previously deposited waste as much as possible and the local fire department advised. This may be done by either moving burning wastes to another area or by concentrating the burning wastes using the landfill earth-moving equipment.

Once burning material is separated from other exposed waste, the application of cover soil by landfill earth-moving equipment or the application of water by a water tank truck to extinguish the fire can be carried out.

If, at any time, additional assistance is required, local fire-fighting units will be contacted as-soon-as possible.

3.5.1.3 Release of Explosive Gases

Methane gas generation and concentration is not anticipated to be a problem at the landfill since no MSW is disposed at the site.

3.5.1.4 Explosion

In the event that an explosion should occur or seem eminent at the landfill; the landfill site, all personnel in the area, will be evacuated immediately. In addition, site equipment will be moved away from the area, if possible.

All landfill personnel will be accounted for and local emergency personnel (fire, police) will be contacted and informed of the situation. The Landfill Supervisor will be immediately informed of the situation and will notify the Executive Secretary immediately.

The explosion area will be restricted to both landfill personnel and residents until cleared for re-entry by local emergency personnel. If an explosion occurs at the landfill, a remediation plan for methane gas will be placed in the operation records within 60 days.

3.5.1.5 Failure of Run-Off Containment

The purpose of the run-on/run-off control systems is to manage the storm water falling in or near the landfill. Water is diverted away from the landfill using a series of ditches and berms. These ditches are inspected on a regular basis and repaired as needed. All water falling on the working face is unable to flow out of the working area due to surface depressions left by the compactor. All storm water falling or flowing near the active landfill cell is prevented from flowing into the active area by diversion berms and ditches.

If the run-on or run-off system fails, temporary measures such as temporary berms, ditches, or other methods are used to divert water from the active landfill cell. The following actions will be taken to minimize the impact to the facility:

- Landfill personnel will immediately suspend filling operations, if containment failure is in an active fill area.
- Landfill personnel will use earth-moving equipment to construct temporary earthen berms in an effort to divert the flow of surface water away from the failure area and toward a holding area.
- The Landfill Supervisor will conduct damage assessment. A decision will be made as to whether the damage can be rectified by on-site personnel.
- The Landfill Supervisor will provide the necessary notices to the Executive Secretary and fully document the event in the operating record, including corrective action within 14 days.

3.5.1.6 Groundwater Contamination

If ground water contamination is ever suspected, studies to confirm contamination will be conducted and the extent of contamination documented. This program may include the

installation of ground water monitoring wells. A ground water monitoring program would be developed and corrective action taken as deemed necessary, with the approval of the Executive Secretary.

3.6 CONTINGENCY PLAN FOR ALTERNATIVE WASTE HANDLING

Based on historical operations and a history of never needing to close down the site, landfilling operations should not have to be suspended due to inclement weather conditions or interruption of service. In the event that the NCL is not able to accept waste; all waste will be diverted to the Emery County Landfill (contingency plans have been arranged with Emery County).

3.7 MAINTENANCE PLAN

The following subsections offer a description of the maintenance of installed landfill equipment systems.

3.7.1 Groundwater Monitoring System

The Nielson Construction is not required to monitor groundwater as part of the landfilling operations; therefore, no maintenance will be required.

3.7.2 Leachate Collection and Recovery System

Leachate is not collected as part of the landfilling operations; therefore, no maintenance activities will be required.

3.7.3 Gas Monitoring System

Nielson Construction is not required to collect landfill gas as part of the landfilling operations; therefore, no maintenance will be required.

3.8 DISEASE AND VECTOR CONTROL

The vectors encountered at the landfill are flies, birds, mosquitoes, rodents, skunks, and snakes. Due to the rural location of the landfill, stray house pets are occasionally encountered at the landfill. The program for controlling these vectors is as follows:

3.8.1 Insects

Eliminating breeding areas is essential in the control of insects. Landfill personnel minimize the breeding areas by covering the waste with soil every 30 days (minimum) and maintaining surfaces to reduce ponded water.

3.8.2 Rodents

Reducing potential food sources (no MSW) minimizes rodent populations at the landfill. To date, no significant numbers of mice or rats have been observed. The lack of MSW and the nature of the waste at the landfill do not provide a food source for vectors.

In the event of a significant increase in the number of rodents at the landfill, a professional exterminator will be contacted. The exterminator would then establish an appropriate protocol for pest control in accordance with all county, state and federal regulations.

3.8.3 Birds

The landfill has had minimal problems with birds due to the lack of food source. Good landfilling practices of waste compaction, covering waste with soil, and the minimization of ponded water has to date alleviated most of the potential bird problems.

3.8.4 Household Pets

Because of the landfill's location, some stray cats and dogs have wandered onto landfill property. When stray animals are encountered (and can be caught), they are turned over to the animal shelter. If we are unable to apprehend the animals, they are chased off the property.

3.8.5 Wildlife

The landfill has a variety of wildlife located on or near the landfill property. Wildlife includes deer, snakes, foxes, skunks, and coyotes. The only operational problems with wildlife to date have been with an occasional skunk or snake. When problem skunks or snakes are encountered, they are exterminated. If other site wildlife becomes a problem, the landfill will coordinate with the Division of Wildlife Resources to provide methods and means to eliminate the problem.

In the event that any of these vectors become an unmanageable problem, the services of a professional exterminator will be employed.

3.8.6 Fugitive Dust

The roads leading to the landfill gate and the access road to the landfill base are paved, however; landfill construction activities and daily traffic produce a certain amount of dust. Landfill activities compounded by the occasional high wind present a fugitive dust problem. If the dust problem elevates above the "minimum avoidable dust level", the landfill applies water to problem areas with a Nielson Construction maintained water truck.

3.8.7 Litter Control

Due to the nature of all landfilling operations, litter control is always an ongoing concern. Landfill personnel perform routine litter cleanup to keep the landfill and surrounding properties clear of windblown debris. The nature of the waste delivered to the landfill is heavy mine related wastes and not prone to being wind blown.

During windy conditions, landfill personnel minimize the spreading of the waste to reduce the potential for windblown debris

3.9 RECYCLING PROGRAM

The NCL has a somewhat limited recycling program due to its relatively small daily waste streams and the logistical remoteness from viable recycling markets. Metal products are periodically separated from the landfill waste stream when practical and when the recycled metal market will pay for the costs of the metal diversion.

3.10 TRAINING PROGRAM

Landfill personnel will be trained on how to identify unacceptable waste including liquid wastes, sludge, potential regulated hazardous waste, and PCB wastes. Training will also address the proper handling of unacceptable waste.

All employees will receive on the job training in landfill operations and waste screening equivalent to the SWANA training course titled "Sanitary Landfill Operator Training". This training will include operations and safety training. New employees will receive training during their first month of employment.

The Landfill Supervisor will arrange for annual refresher training in addition to the initial landfill orientation. Documentation of all personnel training will be kept on site and submitted as part of the Annual Landfill Report.

3.11 RECORDKEEPING

Nielson personnel will maintain an operating record which will be available at either the Landfill trailer or Nielson Construction offices. This record will include: operation records, inspection documentation, personnel training documents, annual reports, financial assurance records and a copy of the current landfill permit.

Records will be kept throughout the life of the facility, including post-closure care. Documents will be organized, legible, dated, and signed by the appropriate personnel.

3.11.1 Weights or Volumes of Incoming Waste

Nielson personnel will record and retain in the operating record all documentation made with respect to any weights or volumes of incoming wastes as allowed by State of Utah Administrative Rule R315-302-2.

3.11.2 Number of Vehicles Entering Facility

Nielson personnel will record and retain in the operating record all documentation made with respect to the number of vehicles entering the facility as allowed by State of Utah Administrative Rule R315-302.

3.11.3 Types of Wastes Received Each Day

Nielson personnel will record and retain in the operating record all documentation made with respect to the types of waste received each day at the facility as allowed by State of Utah Administrative Rule R315-302.

3.11.4 Deviation from Approved Operations Plan

At any time during the operational life or post-closure care period of the NCL, UDEQ may set alternative schedules for recordkeeping and notification. However, it is anticipated that any

modifications to the schedule for recordkeeping will be discussed with Nielson Construction personnel prior to official notice from the State of Utah.

3.11.5 Training Procedures

Nielson Construction will record and retain in the operating record all documentation made with respect to any training programs or procedures as allowed by State of Utah Administrative Rule R315-302.

3.11.6 Inspection Log or Summary

Nielson Construction will record and retain in the operating record all documentation made with respect to any inspection logs or summary sheets as allowed by State of Utah Administrative Rule R315-302

3.11.7 Closure and Post-Closure Care Plans

Nielson Construction will record and retain in the operating record all documentation made with respect to the closure and post-closure care plans as allowed by State of Utah Administrative Rule R315-302-3.

3.11.8 Cost Estimates and Financial Assurance Documentation

Nielson Construction will record and retain in the operating record all documentation made with respect to the cost estimates and financial assurance documentation as allowed by State of Utah Administrative Rule R315-309.

3.11.9 Other Records as Required by the Executive Secretary

Nielson Construction will record and retain in the operating record all documentation made with respect to other processes, variances, and violations as required by the State of Utah.

3.12 SUBMITTAL OF ANNUAL REPORT

Nielson Construction (the Landfill Supervisor) will submit a copy of its annual report to the Executive Secretary by March 1 of each year for the most recent calendar or fiscal year of facility operation. The annual report will include facility activities during the previous year and will include, at a minimum, the following:

- Name and address of facility.
- Calendar or fiscal year covered by the annual report.
- Annual quantity, in tons or volume, in cubic yards, and estimated in-place density in pounds per cubic yard of solid waste handled for each type of treatment, storage, or disposal facility, including applicable recycling facilities.
- Annual update of required financial assurances mechanism pursuant to Utah Administrative Code R315-309.
- Training programs completed.

3.13 INSPECTIONS

The Landfill Supervisor, or his/her designee, will inspect the facility to prevent malfunctions and deterioration, operator errors, and discharges that may cause or lead to the release of wastes to the environment or to a threat to human health. These inspections will be conducted on a quarterly basis, at a minimum. An inspection log will be kept as part of the operating record. This log will include at least the date and time of inspection, the printed name and handwritten signature of the inspector, a notation of observations made, and the date and nature of any repairs or corrective actions. Inspection records will be available to the Executive Secretary or an authorized representative upon request.

3.14 RECORDING WITH COUNTY RECORDER AND THE STATE OF UTAH DIVISION OF SOLID AND HAZARDOUS WASTE

Plats and other data, as required by the County Recorder, will be recorded with the Emery County Recorder as part of the record of title no later than 60 days after certification of closure. Additionally, Nielson Construction personnel will submit proof of record of title filing to the Executive Secretary.

3.15 STATE AND LOCAL REQUIREMENTS

The Nielson Construction will maintain compliance with all applicable state and local requirements including zoning, fire protection, water pollution prevention, air pollution prevention, and nuisance control.

3.16 SAFETY

Landfill personnel are required to participate in an ongoing safety program. This program complies with the Occupational Safety and Health Administration (OSHA), and the National Institute of Occupational Safety and Health (NIOSH) regulations as applicable. This program is designed to make the site and equipment as secure as possible and to educate landfill personnel about safe work practices. First Aid and CPR training is made available to all Nielson Construction personnel annually.

3.17 EMERGENCY PROCEDURES

In the event of an accident or any other emergency situation, the Waste Screener (Equipment Operator) notifies the Landfill Supervision and proceeds as directed. If the Landfill Supervisor is not available, the Waste Screener calls the appropriate emergency number posted by the telephone. The emergency telephone numbers are:

Emery County Central Dispatch 911
Fire Department 911
Sheriff's Office..... (435) 381-2404
Highway Patrol ..... (435) 637-0893
Carbon/Emery County Fire Marshal..... (435) 637-0893
Castleview Hospital..... (435) 637-4800
James Davis, Landfill Supervisor..... (435) 749-9036

APPLICATION TO RENEW A PERMIT TO OPERATE A CLASS I LANDFILL

Nielson Landfill

PART III - TECHNICAL AND ENGINEERING REPORT

TABLE OF CONTENTS

1.0 - GEOHYDROLOGICAL ASSESSMENT

1.1 GEOLOGY AND HYDROLOGY

1.1.1 Regional Geology

The Nielson Landfill is located near the western boundary of Castle Valley, in the Mancos Shale Lowlands section of the Colorado Plateau (Witkind, 1995; Hintze, 1993; Hintze, 1980; Stokes, 1986). Castle Valley is an erosional valley located in the western portion of the Colorado Plateau Province, within a series of northerly-dipping Cretaceous age units that form the sinuous margin between the southern Uinta Basin and the San Rafael Swell. These Cretaceous age strata comprise the Book Cliffs, Roan Cliffs and other prominent topographic rises. The Colorado Plateau Province is characterized by high plateaus and intervening lowlands, which contain relatively continuous geologic strata. These plateaus were not as widely affected by the prevalent large-scale normal faulting that characterizes the Basin and Range Province farther to the west. The Lowlands are the largest region of level land in central and eastern Utah, extending from the town of Emery eastward to Utah's border with Colorado. The western edge of the Mancos Shale Lowlands occurs at the eastern edge of the Great Basin-Colorado Plateau Transition Province, adjacent to the Wasatch Plateau.

Surface drainages flow eastward out of the Wasatch Plateau, across Castle Valley to Green River. The Mancos Shale Lowlands are crossed by only a few permanent streams and by a great number of intermittent washes draining higher country to the north and west.

Groundwater resources are limited near the NCL. Small quantities of ground water (less than 10 gallons per minute) are produced in the southern portion of Castle Valley from the Ferron Sandstone Member of the Mancos Shale. Groundwater quality is poor, with total dissolved solids (TDS) usually exceeding 3,000 milligrams per liter (mg/l) (Lines and Morrissey, 1983).

1.1.2 Local Geology

The NCL has been constructed on Wilberg Flat, a young pediment surface in the eastern half of section 16. Much of the pediment gravel on Wilberg Flat was formed by erosion and redeposition of older pediment gravel exposed at higher elevations on Danish Bench, to the

west of the landfill. The balance of the gravel was eroded directly from sandstones that cap the Mancos Shale in bluffs five miles northwest of the landfill.

Wilberg Flat is underlain by the Main Body of the Blue Gate Member consists of light-bluish-gray and gray, thin- to medium-bedded shale and shaley siltstone that contains sparse interlayered thin sandstone beds (Witkind, 1995). This unit is reported to be up to 610 meters thick and at the site; the formation is observed to form rounded hills with relatively flat plateau tops.

The boundary between Wilberg Flat and the older pediment surface of Danish Bench occurs along a northwest to southwest trending, northeast facing bluff. The bluff is approximately 120 feet high near the center of Section 16. Approximately 10 feet of older pediement gravel overlies Mancos Shale at the top of the bluff. The remainder of the bluff is shale, locally obscured by loose fragments of gravel eroded form the pediment gravel at the top of the bluff. Appendix D contains previously generated geologic information.

1.1.3 Permeability

The most pertinent layer separating the migration of water and contaminants from the surface to deeper aquifers is the Blue Gate Member of the Mancos Shale that extends from near surface to approximately 1600 feet below the NCL. Results of slug tests performed in two monitor wells drilled into the Blue Gate Member of the Mancos Shale were submitted to the Utah Division of Solid and Hazardous Waste by Bingham Environmental, Inc. The interval tested was from 30 to 110 feet below the existing ground surface. Bingham Environmental reported an average hydraulic conductivity of $5x10^{-5}$ cm/sec. Bingham also reported an average effective porosity of six percent for the shale in this interval.

1.1.4 Hydrology

The NCL site is located in alluvial outwash located several miles from the east slope of the Wasatch Mountains. The terrain consists of small washes, ravines and ridges. These washes may collect local runoff and transport small quantities of water over short distances, but do not appear to transport runoff and flash flood waters/debris flow of significant volume over long distances. This is apparent due to the lack of recent erosion in the washes surrounding the site.

Based on a review of climatological data for the Orangeville area, wet years produce 10 to 13 inches of total annual rainfall. Average annual rainfall at the site over the past nearly 100 years is 8.5 inches. Average annual evapotranspiration at the site is over 45 inches (Utah Climate Center, Utah State University). As shown, the NCL site is arid and the majority of the precipitation is soaked up by the surface soils. However, during high intensity precipitation events some brief flash flooding can occur.

1.2 HYDROGEOLOGY AND GROUNDWATER

The only significant aquifer near the NCL is the Ferron Sandstone Member of the Mancos Shale. The Ferron Sandstone Member occurs directly below the Blue Gate Member about 1,600 feet below the existing ground surface at the landfill location.

The largest source of recharge to the Ferron Sandstone aquifer is subsurface inflow from the west under the Wasatch Plateau. Subsurface inflow near the town of Emery was estimated by Lines and Morrissey at 2.4 cubic feet per second. Most of this moves laterally through crushed zones in the Joes Valley fault system. Lines and Morrissey also stated that "little" water is recharged to the aquifer by precipitation on the outcrop area. Data from Lines and Morrissey suggest that near the NCL, the groundwater in the Ferron Sandstone aquifer flows from west to east and infiltration from the surface to the Ferron Sandstone is negligible.

The Blue Gate Member of the Mancos Shale lies directly above the Ferron Sandstone Member and extends to the surface near the NCL site as stated previously. The Blue Gate Member is not considered a good aquifer. An aquifer is defined as "a permeable geologic unit that can transmit and store significant quantities of water (Maidment, 1992). The Blue Gate is permeable where fractured, but neither transmits not stores significant quantities of usable water. Based on a single boring completed by Tahoma, a minor amount of perched groundwater was encountered at 140 feet and a more significant water table was encountered at 372 below the existing ground surface. No information on the direction of flow for this groundwater was available; however we anticipate all groundwater flow to be from the west to east based on the hydrogeologic conditions at the site.

1.3 WATER RIGHTS

Records of the Utah Division of Water Rights have been reviewed to obtain information on points of diversion, water use classifications and depths of wells near the NCL. No water rights or points of diversion have been claimed or developed within a one mile radius of the landfill or within Section 16. The points of diversion plots are included in Appendix E.

1.4 SURFACE WATERS

There are no permanent impoundments or surface water or perennial streams present within a one mile radius of the site.

1.5 BACKGROUND WATER QUALITY

1.5.1 Surface Water

Because there are no permanent surface water impoundments on or near the site, no surface water quality assessment was performed.

1.5.2 Groundwater

Tahoma recovered water samples at 372 feet from the water table encountered in the Blue Gate Member of the Mancos Shale formation during drilling. These samples were analyzed by the Southern Utah University Water Laboratory. The results of the test indicate a total dissolved solids (TDS) content of 38,400 mg/l.

Published information on the quality of water in the Ferron Sandstone Aquifer was summarized by Lines and Morrissey (1983). Their summary shows that the TDS in groundwater taken from the Ferron Sandstone Member ranged from 500 to more that 50,000 mg/l. The following table summarizes findings from Lines and Morrissey for locations closest to the Nielson Landfill:

Section	Township	Range	Sample Depth (ft)	TDS (mg/l)
25	17 South	7 East	Not Known	14,541
16	17 South	10 East	185-205	3,840
27	20 South	7 East	804-806	21,534
3	20 South	8 East	105	8,120
4	20 South	8 East	120	10,100

1.6 SITE WATER BALANCE

As stated previously in the Hydrology Section of this report, due to the amount of precipitation and evapotranspiration we anticipate runoff from the NCL to be minimal. Previous studies (Tahoma) used HELP3 computer program to model the site water balance. Results from the initial HELP3 analysis are included in Appendix F.

2.0 - ENGINEERING REPORT

2.1 LOCATION STANDARDS - EXISTING AND PROPOSED LANDFILL EXPANSION

In addition to the Subtitle D criteria, DSHW has adopted specific location standards. The Utah location standards as presented in the Solid Waste Permitting and Management Rules (R315-302) are outlined below:

- Land Use Compatibility (UAC R315-302-1(2)a)
  - Not to be located within 1000 feet of Parks and protected areas
  - Not to be located in an ecologically and scientifically significant area
  - Not to be located on prime or unique farmland
  - Not to be located within ¼ mile of existing dwellings, incompatible or historical structures, unless allowed by local land use planning or zoning
  - Not to be located within 5,000 feet of airport runways
  - Not to be located on archeological sites

- Geology (UAC R315-302-1(2)b)
  - Proximity to a Holocene Fault
  - Considerations for constructing in a seismic impact zone
  - Consideration given to unstable areas

- Surface Water (UAC R315-302-1(2)c)
  - Will not affect public water system
  - Will not affect existing lakes, reservoirs and ponds
  - Cannot be located in a floodplain unless certain criteria are met

- Wetlands (UAC R315-302-1(2)d) Not allowed unless:
  - Alternative location has been denied previously
  - Will not violate state water quality standard or Clean Water Act
  - Will not jeopardize threatened or endangered species
  - Will not cause or contribute to significant degradation of the wetlands

- Groundwater (UAC R315-302-1(2)e)
  - Groundwater/landfill cell separation
  - Sole source aquifer
  - Groundwater quality
  - Source protection areas

The following sections present the landfill location standards and discuss the status of the NCL's compliance with those requirements.

2.1.1 Land Use Compatibility Requirements

The existing landfill and proposed expansion meets all criteria outlined in UAC R315-302-1(2)(a) as shown below. Documentation of the items listed below is found in Appendix G.

2.1.1.1 Nielson Landfill Land Use Compatibility

- The existing facility and proposed expansion is not within 1,000 feet of a national, state or county park, monument or recreation area; designated wilderness or wilderness study area; or wild and scenic river area.

  Source: Gnojek, Tom, U.S. Bureau of Land Management, San Rafael River Resource Area, Price, Utah. See letter from Tahoma Companies dated April 5, 1994.

- The facility is not within an ecologically and scientifically significant natural area, including wildlife management areas and habitat for threatened or endangered species as designated pursuant to the Endangered Species Act of 1982.

  Source: Williams, Robert D., U.S. Fish and Wildlife Service; Salt Lake City, Utah. See letter from Tahoma Companies dated March 31, 1994.

- The facility is not located on farmland classified as "prime" or "unique."

  Source: Jacobsen, Kyle "Jake", Utah Department of Agriculture, Salt Lake City, Utah. See letter from Tahoma Companies dated March 30, 1994.

- The facility is not within one-fourth mile of:

  a) Existing permanent dwellings, residential areas and other incompatible structures such as schools or churches.

  Source: Field investigation by Brett Mickelson of IGES, Inc.

  b) Historic structures or properties listed or eligible to be listed in the State of National Register of Historic Places.

  Source: Dykmann, James L., State of Utah, Utah State Historical Society. See letter from Tahoma Companies dated March 30, 1994 and response letter form the State of Utah dated April 12, 1994.

- The facility is not within 10,000 feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway used by any piston-type aircraft.

  Source: Rodda, Dave, Aviation Safety Inspector, Federal Aviation Agency, Salt Lake City, Utah. See letter from Tahoma Companies dated April 11, 1994.

- The facility is not within an archaeological site that would violate Section 9-8-204.

  Source: Dykmann, James L., State of Utah, Utah State Historical Society. See letter from Tahoma Companies dated March 30, 1994 and response letter form the State of Utah dated April 12, 1994.

- The facility is not within an area that is at a variance with the Emery County land use plan or zoning requirements.

  Source: Funk, Rex, Emery County Road Department.

2.1.2 Geology and Geotechnical Engineering

2.1.2.1 Geologic Hazards

The Utah State Regulations indicate "No new facility or lateral expansion of an existing facility shall be located in a subsidence area, a dam failure flood area, above an underground mine, above a salt dome, above a salt bed, or on or adjacent to geologic features which could compromise the structural integrity of the facility".

The NCL is not adjacent to geologic features that could compromise the structural integrity of the facility. The landfill is not in a subsidence area, a dam failure flood area, above an underground salt dome or a salt bed. Minor washes through the site could be subject to debris flow and/or alluvial fan flooding but in general these washes are not large enough to convey water or debris of sufficient quantity to jeopardize the landfill.

2.1.2.2 Fault Areas

A new landfill may not be located within 200 feet of an active (Holocene) fault. There are no known active faults that pass under or within 200 feet of the NCL (Witkind, 1995; Hecker, 1993). The site is located approximately 21 miles east of the Joe's Valley fault zone. This fault zone is reported to have been active in Holocene time and to have a 7.5 M_S estimated maximum credible earthquake (Hecker, 1993). The site is also located approximately 38 miles southeast of the Strawberry Valley fault. The Strawberry fault has a reported rupture length of 17.4 miles and a maximum potential magnitude of 7.0. The most recent activity on the Strawberry fault is reported to be early to middle Holocene.

2.1.2.3 Seismic Impact Zone

The EPA and the DSHW define a seismic impact zone as any location with a 10% or greater probability that the maximum horizontal acceleration (MHA) in lithified earth material, expressed as a percentage of the earth's gravitational pull, will exceed 0.10g in 250 years. Tahoma Companies in 1996 indicated there was a 10 percent chance in 250 years that the area could experience horizontal accelerations of 0.20g or greater. Updated mapping by USGS Earthquake Hazards Program – National Seismic Hazard Mapping Project indicates the predicted Maximum Horizontal Acceleration (MHA) at the site is 0.266g. Therefore, the site does lie within a Seismic Impact Zone.

The MHA in lithified earth material is defined in 40 CFR part 258.14 (EPA 1991) as the "maximum expected horizontal acceleration depicted on a seismic hazard map with a 90% or greater probability that the acceleration will not be exceeded in 250 years, or the maximum expected horizontal acceleration based on site specific seismic risk assessment." This definition was adopted in full by the DSHW. The MHA of 0.2g or greater indicated by Tahoma in 1996 was based on modified USGS maps from "Probabilistic Earthquake Acceleration and Velocity Maps for the United States and Puerto Rico by S.T. Algermissen, D.M. Perkins, P.C. Thenhaus, L.S. Hanson and B.L. Bender (1990)". These maps have recently been superseded by the "United States Geologic Survey's (USGS) Earthquake Hazards Program – National Seismic Hazard Mapping Project". Based on the latitude and longitude of the site, these more recent maps indicate an MHA value of 0.266g for the site. This value is an estimated ground surface acceleration of a "firm rock" site, which is identified as having a shear-wave velocity of 760 m/sec in the top 30 meters and sites with different soil types may amplify or de-amplify this value.

Based on our limited field investigations and our understanding of the soils at the site, it is our opinion the site best fits within the International Building Code (IBC) Site Class B described generally as "rock" having seismic coefficients $F_a = 1.0$ and $F_v = 1.0$.

2.1.2.4 Seismic Impact Zone Analysis

A seismic study was performed by Tahoma Companies, Inc. in May of 1996, and is included as Appendix H. IGES performed a review of Tahoma's seismic study and felt additional analysis should be performed based on the more recent and updated data available pertaining to the waste and soil strength properties and the updated MHA information discussed previously.

Based on the proposed landfill geometry, new cross-sections of the bottom excavation and final cover were generated and used in modeling static and seismic stability. The most critical sections based on the geometry of the bottom excavation and final covers were modeled. These sections and slope stability modeling are presented in Appendix I.

The MSW unit weight and strength properties assumed by Tahoma were reviewed. Tahoma used a unit weight value of 50.73 pounds per cubic foot (pcf). Based on a review of the daily

cover and compaction processes currently in use at the NCL we estimate the unit weight of the refuse to be as low as 1000 pounds per cubic yard (pcy) and up to 1400 pcy, depending on the height of the overburden. This corresponds to 37 and 52 pcf, respectively, and therefore we feel 51 pcf is a reasonable representation of the MSW unit weight. Static and pseudo-static slope stability models were performed on Section 1-South with the minimum unit weight of 37 pcf, which yielded an approximate increase of 9% in the factors of safety with respect to the assumed 51 pcf. Assuming a unit weight of 51 pcf for the MSW incorporates time dependant consolidation that may take place and is conservative as the higher unit weight represents a higher instability driving force for both the static and pseudo-static cases.

Based on a large scale direct shear test performed in-situ to measure strength properties of MSW, Withiam et al, 1995, obtained a friction angle of 30 degrees and a cohesion intercept of 200 pounds per square foot (psf). Other work by Kavazanjian et al (1995), suggest a friction angle of 33 degrees and a shearing strength of 500 psf below a normal stress of 627 psf for MSW. Based on this information a value of 30 degrees for the angle of internal friction and 150 psf for the cohesion intercept were used to define the strength properties of the anticipated MSW. These parameters compare to MSW strength properties of 20 degrees and 100 psf for the friction angle and cohesion intercept used by Tahoma.

Strength properties and unit weight of the on-site shale were estimated by Tahoma to have a friction angle of 22 degrees and a cohesion intercept of 3,446 psf as well as a unit weight of 147.5 pcf. No basis for these values, such as laboratory testing, was presented. An analysis was performed using RocData v.4.0 by RocScience to validate the strength parameters used by Tahoma. The analysis, which utilizes an extensive database of rock strength data, yielded a friction angle of 22 degrees for the range of stresses from 0 to 16,000 psf and a cohesion intercept of 1250 psf, slightly lower than that used by Tahoma. A reasonable unit weight for the shale was assumed to be 145 pcf.

To estimate the potential amplification of the free field acceleration (0.266g) as it travels up to the surface and then to the top of the landfill, the simplified approach developed by GeoSyntec was used. This method uses the information from Singh and Sun (1995) and Kavazanjian and Matasovic (1995) in a three step procedure to estimate the potential amplification. The three step procedure is outlined as follows: 1) classify the soils in the top 100 feet; 2) estimate the free field peak ground surface acceleration at the base of the refuse; and 3) estimate the peak acceleration at the top of the landfill.

Based on the soil profile initially identified by Tahoma Companies, Inc. the upper 100 feet of material classifies as a firm rock site (firm rock soil profile according to IBC 2006). Therefore, a MHA of 0.266g was used as the ground surface acceleration at the base of the refuse. Based on an average shear wave velocity of 700 feet per second and using the analytical data from Singh and sun (1995), the peak acceleration for a 200 foot high fill was 0.166g and 0.325g for a 100 foot high fill. Using linear extrapolation for the maximum fill height of approximately 70 feet, the anticipated peak acceleration is 0.373g. Appropriately, an average acceleration of 0.293g was used in the stability and deformation analysis performed for the waste mass (Repetto et al., 1993).

Hynes and Franklin (1984) performed several Newmark seismic deformation analyses on embankments using 387 strong motion records and 6 artificial accelerograms. The analyses performed considered the yield accelerations (minimum acceleration to cause failure) of the slope sections evaluated by pseudo-static methods and compared them to the anticipated horizontal embankment accelerations. Based on these analyses performed by Hynes and Franklin, deformations are anticipated to be one meter or less if the yield acceleration is less than or equal to one-half the horizontal acceleration, with a 20% reduction in shear strength of the waste mass. Therefore, using a horizontal acceleration of 0.147g to obtain a pseudo-static factor of safety of 1.0 or greater indicates satisfactory performance of the waste mass under seismic conditions (deformation less than 1 meter).

Static and pseudo-static analyses of the slope sections were performed using critical sections of the landfill geometry and the soil and waste parameters outlined previously. Results of these analyses are presented in Appendix I. The static and pseudo-static slope stability analyses were completed using the computer program SLIDE v.5.032 by RocScience. The properties used in the slope stability analyses are summarized below.

Material	Unit weight (pcf)	Cohesion intercept, static (psf)	Cohesion intercept, seismic (psf)	Friction angle, static (deg)	Friction angle, seismic (deg)
MSW	51	150	120	30	25
Shale	145	1,250	1,250	22	22

A summary of the static and seismic (pseudo-static and deformation) analyses, based on the change in the waste strength parameters and the new seismic data generated for the soil profile, is presented below. Slope stability runs of the static and seismic analyses are provided in Appendix I.

Section	Direction	Analysis	Minimum FS	Deformation (meters)
1	North	Static	3.59	-
1	North	Seismic	1.76	<1
1	South	Static	3.06	-
1	South	Seismic	1.54	<1
2	East	Static	3.99	-
2	East	Seismic	1.96	<1
2	West	Static	3.32	-
2	West	Seismic	1.60	<1
3	East	Static	3.56	-
3	East	Seismic	1.74	<1
3	West	Static	3.48	-
3	West	Seismic	1.67	<1

Typical allowable limits in stability analysis are; a minimum factor safety of 1.5 for static conditions, a minimum factor of safety of 1.0 during pseudo-static (seismic) conditions, and a maximum allowable deformation of 1 meter. Based on the results of the analyses performed using the planned geometry of the landfill with 3H:1V excavation slopes in the bottom of the landfill and 4H:1V slopes in the final cover, the stability of the slopes in all areas is above the minimum standards.

2.1.2.5 Unstable Areas

The owner or operator of a landfill must consider several factors when determining whether and area is unstable. Among them are soil conditions, geologic or geomorphic features, and human-made features or events at the surface and in the subsurface.

Soil conditions at the NCL site are well suited for construction of a landfill. The site is in a relatively remote area in the foothills of the eastern slope of the Wasatch Mountain Range. The soils underlying the site consist predominantly of Shale Bedrock with some areas containing an overburden layer of silty gravel that is relatively dense and sometimes moderately cemented. The shale is reported to be approximately 1650 feet thick beneath the landfill.

The gravel and shale material underlying the landfill site is relatively incompressible given the height and unit weight of the waste mass. Settlement of the landfill will be limited to consolidation within the waste itself and not the underlying soils. Several inches of consolidation within the waste should be anticipated, however, ten to one (10H to 1V) slopes should be adequate for maintaining adequate drainage.

Geologic features on or near the site would include the minor washes at the site, which could be subject to debris flow and/or alluvial fan flooding. However, as mentioned previously in Section 2.1.2.1 Geologic Hazards, the site is located outside of any washes large enough to convey significant flooding or debris flow and therefore the site does not appear to be associated with any potential geologic hazards.

One known geomorphic feature on site that has been altered by humans is an unnamed intermittent wash that passes along the southern edge of the existing landfill.

2.1.3 Surface Water Requirements

DSHW has adopted Subtitle D location restrictions for floodplains and wetlands. The NCL site is not within a floodplain or wetland. All potential run-on water from the drainage will be diverted around the landfill site by shallow ditches or low berms.

No permanent impoundments of surface water or perennial streams are present within a one mile radius of the landfill.

2.1.4 Wetlands Requirements

The NCL is not situated in a designated wetlands area.

2.1.5 Groundwater Requirements

DSHW location restrictions with respect to groundwater protection include the following:

- No new facility shall be located at a site where the bottom of the lowest liner is less than 5 feet above historical high level of groundwater in the uppermost aquifer.

- No new facility shall be located over a sole source aquifer as designated in 40 CFR 149.

- No new facility shall be located over groundwater classified as IB under Section R317-6-3.3 (an irreplaceable aquifer).

- A new facility located above any aquifer containing groundwater which has a total dissolved solids (TDSs) content below 1,000 milligrams per liter (mg/l) and does not exceed applicable groundwater quality standards for any contaminant is permitted only where the depth to groundwater is greater than 100 feet. For a TDS content between 1,000 and 3,000 mg/l, the separation must be 50 feet or greater. These separation distance requirements are waived if the landfill is constructed with a composite liner.

- No new facility shall be located in designated drinking water source protection areas or, if no such protection area is designated, within a distance to existing drinking water wells or springs for public water supplies of 250-day groundwater travel time

2.1.5.1 NCL Groundwater

The NCL complies with the requirements as outlined. The landfill bottom is not within five feet of the historic high level of groundwater. The landfill is not located over a sole source aquifer. The landfill is not located over an irreplaceable aquifer. Groundwater depth is greater than 100 feet. The landfill is not located in a designated drinking water source protection area or near springs or public drinking water wells.

No free groundwater is present within the overburden gravels at the site. In addition, the shale underlying the site is not known to store usable quantities of groundwater. As indicated previously, no water rights or points of diversion have been claimed or developed within a one mile radius of the landfill or within Section 16. Based on this information, the landfill meets the requirements of the groundwater protection location restrictions.

2.2 FACILITY LIFE

The estimated facility life is based on current and projected waste streams, and density estimates of the compacted waste material. The estimated life also takes into account the incorporation of recycling, composting and other programs that might affect the waste stream.

The total air space (volume of landfill) available at the NCL is estimated to be approximately 1.1 million cubic yards. Typical use of cover soils will result in at most 10% of the landfill volume being filled with soil. The reduction in airspace due to cover soils leaves approximately 1 million cubic yards of airspace for waste disposal use. The most recent scale records indicate that the landfill accepts approximately 12 tons per day of waste. The average density of the waste is estimated to be approximately 1,000 pounds per cubic yard initially and increasing to potentially 1,400 pounds per cubic yard as the height of the landfill increases (resulting in a higher compressive load on lower waste). The conservative use of the 1,000 pounds per cubic yard density results in a landfill life of approximately 200 years.

Based on these estimates, the following table shows the capacity and projected life span of each of the nine phases currently planned for development.

Landfill Area	Phase Volume (Cubic Yards)	Waste Capacity (Cubic Yards)	Projected Life Span
Phase I	488,350	439,515	88
Phase II	377,450	339,705	68
Phase III	269,400	242,460	48
Totals		1,021,680	

2.3 CELL DESIGN

The filling of the NCL has been broken into three Phases. The Drawings (Appendix A) show the three Phases of the NCL. The Phases of the Landfill are as described in Sections 3.1 Part II.

2.3.1 Liner

Due to the great distance to groundwater and low permeability of the type of wastes accepted, site soils, arid climate, and high evaporation rate, the NCL is not required to have a synthetic liner.

2.3.2 Fill Method

Wastes will be dumped at the toe of the work face and spread up the slope in one to two foot layers, keeping the working slope at a maximum three to one (horizontal to vertical).

Work face dimensions are kept narrow enough to minimize blowing litter and reduce the amount of soil needed for cover. Working face dimensions will be kept wide enough to safely accommodate vehicles bringing waste into the facility. Grade stakes will be used when necessary to control cell height and top surface grade.

2.3.3 Daily, Intermediate and Final Cover

2.3.3.1 Daily and Intermediate Cover

Daily cover is not required, intermediate cover is required to be placed every 30 days. The soil source for the 30-day (intermediate cover) are site soils located north of the active landfill. The intermediate cover is to minimize the potential for water infiltration, blowing waste, potential vector problems and isolation in case of fire. Intermediate cover will consists of at least 6 inches of site soils.

Damaged areas of the intermediate cover will be regraded and recompacted when necessary to restore the intermediate cover.

2.3.3.2 Final Cover

The NCL will utilize a final cover consisting of 24" of fine-grain site soils. The Drawings (Appendix A) show a cross section of the final cover. The slope of the final cover will be maintained greater than 2% to promote run-off and minimize the potential for erosion.

2.3.3.3 Borrow Sources

As indicated previously, borrow sources for intermediate and final cover comes primarily from the areas north of the existing landfill operation that are located on Nielson owned property. Site soils are derived from the weathering of the Mancos shale.

2.3.3.4 Elevations of Liner and Final Cover

As illustrated on the Drawings (Appendix A), the landfill will not be constructed with a synthetic liner and the bottom of the landfill will be established on native soil without a significant amount of excavation. The bottom of the landfill varies from approximately elevation 5910 to approximately elevation 5930.

The maximum planned elevation for the final cover in Phases I through Phase III is planned to be nearly 5980 feet above mean sea level. Final cover side slopes are planned to be a maximum of 4:1 (horizontal to vertical) with the top surface sloping at a minimum of 10:1.

2.4 MONITORING SYSTEM DESIGN

2.4.1 Groundwater

The NCL is not required to monitor groundwater. As a result groundwater monitoring wells will not be installed and monitoring will not be performed as part of the regular monitoring program.

2.4.2 Leachate Collection and Treatment System

The NCL is exempt from leachate collection and treatment requirements and has no plans to construct a leachate collection system.

2.4.3 Landfill Gas

The NCL is not required to monitor for landfill gas due to the nature of the waste received.

2.5 DESIGN AND LOCATION OF RUN-ON/RUN-OFF CONTROL SYSTEMS

2.5.1 Run-On from a 24-Hour, 25-Year Storm

Elevation data utilized in determining the potential run-on area and natural flow paths was obtained from the Utah Automated Geographic Reference Center (AGRC) in the form of the 10 meter Digital Elevation Model (DEM) for the Red Point 7.5-min quadrangle. Run-on into the landfill from the northwest will be diverted by construction of a ditch/berm along the northern and western boundaries of the landfill. This ditch will deflect all potential run-on from the north-northwest of the facility into natural drainages west-southwest of the landfill.

The proposed run-on control system has been designed to divert flows associated with the 25-year, 24-hour storm (1.9 inches precipitation – National Oceanic and Atmospheric Association). The purpose of the run-on control is to minimize the amount of surface water entering from the landfill from off-site sources. Run-on controls are intended to prevent erosion, which may damage the physical structure of the landfill. The maximum depth of flow associated with run-on for a 25-year 24-hour storm has been estimated to be 14.5 inches. Perimeter ditches/berms are to be constructed with 3H: 1V side slopes and be at least 18 inches deep/high.

2.5.2 Run-Off from a 24-Hour, 25-Year Storm

Run-off controls will be designed to convey surface flows from the final cover of the landfill and temporary ditches/berms will be constructed as needed to manage flows emanating from working/active areas of the landfill. In general, flows will be broken up into four drainage sub-areas from the final cap configuration, and flow from working areas will be channeled to discharge points associated with that final configuration. Flows will be diverted toward the western toe of the landfill slope into a constructed ditch. The ditch will transfer flows to the south then west to the southwest corner of fill where it will be released into the natural drainage which flows along the western side of the site. Surface flows from the northern, eastern and southern slopes will be also directed to a constructed ditch located along the eastern and southern to of the final cap and then through a shallow ditch towards the same drainage. Projected flows from the final cap of the landfill (prior to establishment of vegetation) are projected to have a maximum depth of less than 1-foot during a 25-year, 24-hour storm. All ditches (including the access road drainage ditch) will be constructed to a

minimum depth of 12-inches and have 3H: 1V sideslopes. Appendix J contains the run-on and run-off calculations.

2.6 CLOSURE PLAN - EXISTING AND PROPOSED LANDFILL EXPANSION

2.6.1 Closure Schedule

Closure will occur incrementally with each phase of the landfill being closed once it has been filled to design capacity.

1) Nielson Construction will notify the Executive Secretary of the intent to implement closure in part, 60 days prior to the projected final receipt of waste at the uppermost landfill phase.

2) Nielson Construction will begin closure of each landfill phases within 30 days after receipt of the final volume waste. Closure activities will be completed within 180 days from their starting time, unless an extension is granted by the Executive Secretary.

3) Since the projected life of the landfill is nearly 200 years, closure will be completed in several separate closure events. The closure events will take place when three or four acres of the landfill reaches final design elevations. Once the thickness of final cover is verified, the cover will be planted with a seed mixture to promote indigenous plant growth.

4) When closure is completed, Nielson Construction shall submit construction documentation from a licensed professional engineer in the state of Utah that the site has been closed in accordance with the approved closure plan.

2.6.2 Design of Final Cover

The final cover will consist of a monolithic soil cover constructed from the on-site borrow sources. The cover will be designed to maximize runoff and store remnant precipitation until it can be lost to evaporation and transpiration (evapotranspiration), thus providing a barrier to

infiltration. The final cover design for the landfill has been previously discussed in Section 2.3.3.2.

2.6.3 Final Inspection

The DSHW will be invited to inspect the final grading of the landfill. After approval of the final grading, a schedule will be established for vegetation. Nielson Construction personnel will monitor the performance of the vegetation as scheduled in the post-closure care documents.

2.7 POST-CLOSURE CARE PLAN

2.7.1 Site Monitoring

Nielson Construction shall provide post-closure activities for continued facility maintenance and monitoring of the closed landfill for 30 years. The Executive Secretary may continue monitoring (even longer that the 30 year post-closure period) if it is felt more time is needed for the facility to become stabilized and/or to protect human health and the environment.

Landfill settlement will be monitored and surface depressions in the cover repaired if excessive consolidation of the wastes occurs to a degree that could pond water.

2.7.1.1 Gas Monitoring

Gas monitoring is not required for the NCL.

2.7.1.2 Land Monitoring

Post-closure monitoring will be conducted quarterly throughout the closure and post-closure period. Landfill topography shall be visually checked for depressions that could results in ponding or rapid erosion. Irregularities in the surface of the final cover will be regraded and revegetated as needed to protect the surface from erosion and to eliminate ponding.

Side slopes will be maintained or reestablished with a maximum gradient of 4:1 and the top slopes will be maintained at no less than 10:1 to prevent ponding. The frequency of

monitoring may be reduced only after a successful demonstration to the Executive Secretary that the closed landfill has stabilized.

Unscheduled monitoring of the landfill surfaces will be conducted after a 25-year storm event.

2.7.1.3 Groundwater Monitoring

Groundwater monitoring is not required for the NCL.

2.7.1.4 Surface Water Monitoring

During post-closure, run-off from the final cover will be directed by ditches and berms along the perimeter of the landfill site into a natural drainage that exits along the southern side of the landfill. The ditches will be inspected quarterly through the post-closure period. Repairs will be completed as part of the maintenance activities.

2.7.2 Changes to Record of Title, Land Use and Zoning

The Emery County Recorder will be provided plats and a statement of fact concerning the location of any disposal site no later than 60 days after certification of closure, as per Section 302-2(6) of the Rules. A description of the landfill history and filled areas will be permanently appended to the record of title. Land use restrictions will be assigned to the site in compliance with existing regulations for closed landfills at the time of closure.

2.7.3 Maintenance

Post-closure maintenance activities will be designed and implemented under the direction of a licensed professional engineer. Design decisions will be made after the first post-closure quarterly inspection and implemented within 30 days after identification of maintenance issues. Results of post-closure maintenance shall be reported to the executive secretary by a professional engineer licensed in the state of Utah.

Because of the arid climate in Emery County, maintenance of final covers and run-on/run-off systems should be minimal. Final cover and control structures will be inspected quarterly as outlined in the post-closure plan.

Run-on/run-off control structures and final covers could be damaged by and unusually intense storm. Consequently, an unscheduled inspection will be required after any occurrence of a 25-year storm event within a five-mile radius of the site. If the post-storm inspection discloses damage, it will be appraised by a licensed engineer. The engineer will solicit bids if necessary and supervise repairs completed by Nielson Construction.

2.7.4 Post-Closure Contacts

Post-Closure contact will be the general phone number for Nielson Construction (435) 687-2494.

2.8 POST-CLOSURE LAND USE - EXISTING AND PROPOSED LANDFILL EXPANSION

Nielson Construction will complete a post-closure land use plan to be implemented at the landfill within 5 years prior to the end of the landfill's life. Nielson Construction will select an end use for the landfill consistent with good landfilling practices and will be in accordance with zoning and other regulations in force at the time. The final land use selected for the landfill will be based upon maintaining a functional landfill cover.

Typical end uses range from recycling operations (which complement existing operations) to recreational activities. Since the closure of the site is nearly 200 year's away and additional growth may occur, it is not practical to develop land use plans consistent with surrounding land uses that are not fully known.

2.9 FINANCIAL ASSURANCE

Cost estimates for closure and post-closure care were prepared using the worksheet found in Appendix K. Closure and post-closure costs were obtained from similar costs from other landfills in the State and from estimates from Nielson Construction.

2.9.1 Closure Costs

The closure cost estimates were based on the cost to close the largest area of the disposal facility or unit requiring a final cover, including the cost of obtaining, moving and placing the cover material, final grading, placing topsoil, fertilizing and seeding.

The NCL will be closed incrementally with the largest unit requiring final cover material being limited to 4 acres.

2.9.2 Post Closure Care Costs

The post-closure estimate must be the cost for completing care reasonably expected during the 30-year post-closure period. These tasks include site inspections, maintenance, and record keeping.

2.9.3 Financial Assurance Mechanism

The amount required for financial assurance (for the largest open area) is summarized in the table below:

Total Financial Assurance Costs

Engineering Total:	$4,850
Construction Total:	$36,586
10 % Contingency:	$4,144
TOTAL CLOSURE COSTS:	**$45,579**
POST-CLOSURE COSTS:	**$41,250**
TOTAL FINANCIAL ASSURANCE:	**$86,829**

The financial mechanism Nielson Construction intends to use to meet the requirements will be the issuance of a Surety Bond guaranteeing payment.

3.0 - REFERENCES

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Emery County, UT

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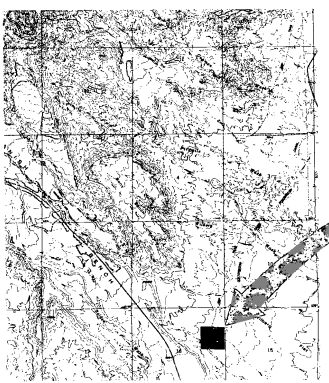
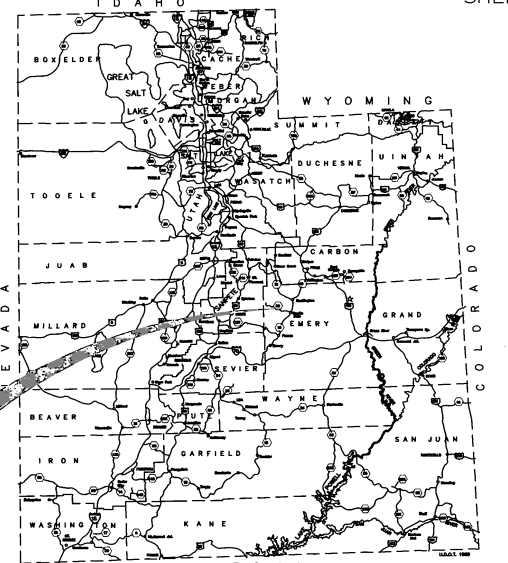


SITE VICINITY MAP



SITE LOCATION MAP

SHEET #	TITLE
1	TITLE SHEET
2	GENERAL ARRANGEMENT
3	PHASE I DEVELOPMENT
4	PHASE II DEVELOPMENT
5	PHASE III DEVELOPMENT
6	PROFILE VIEWS
7	RUN ON HYDROLOGY
8	RUN OFF HYDROLOGY
9	TYPICAL DETAILS

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TITLE SHEET

1

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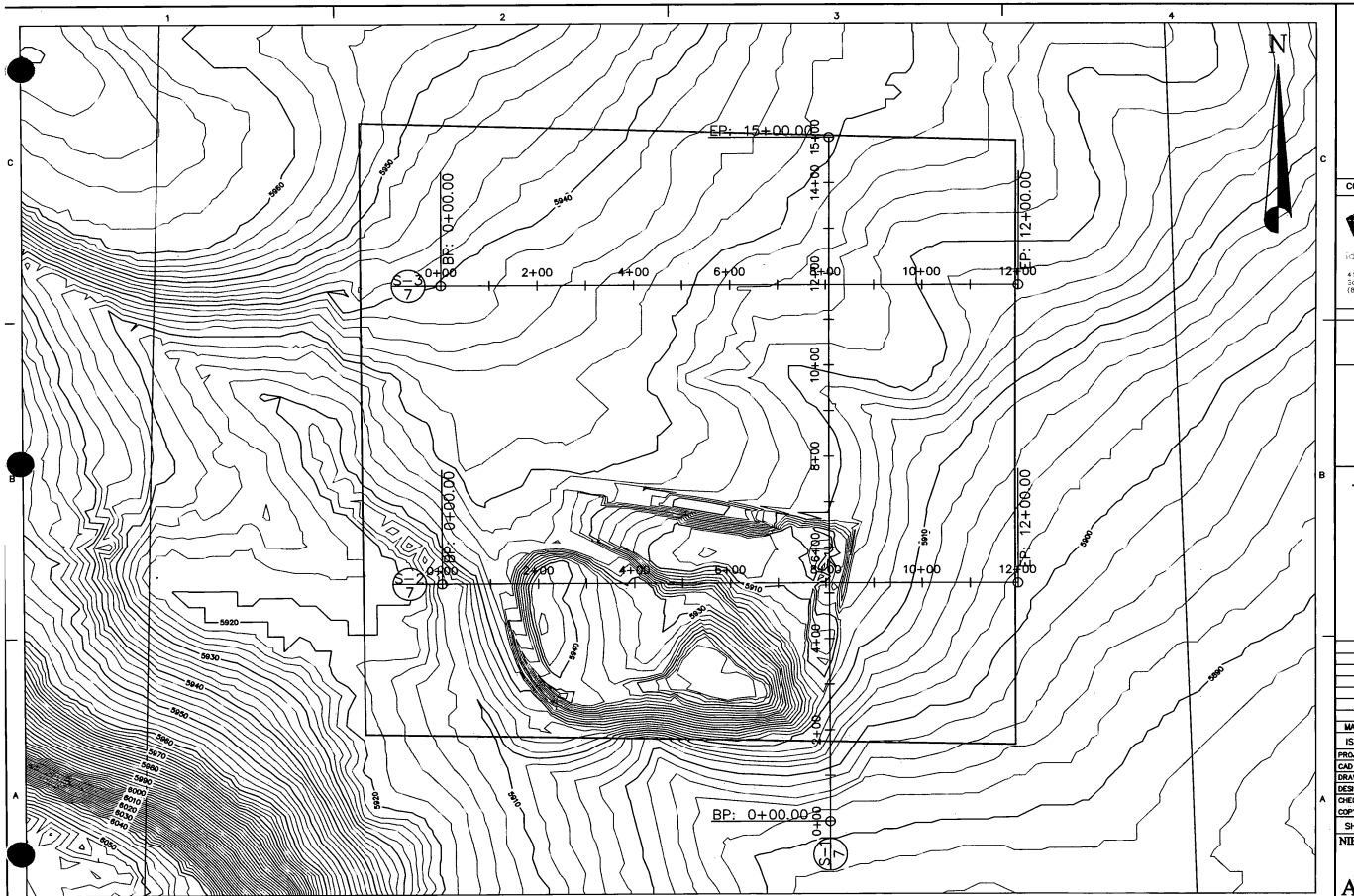

REFERENCE:
BASE ELEVATION OBTAINED FROM 10m DEM by ASRC (USGS 7.5 MIN QUADRANGLE – RED POINT)
AND JOHANSEN AND TUTTLE SURVEYING

1:1

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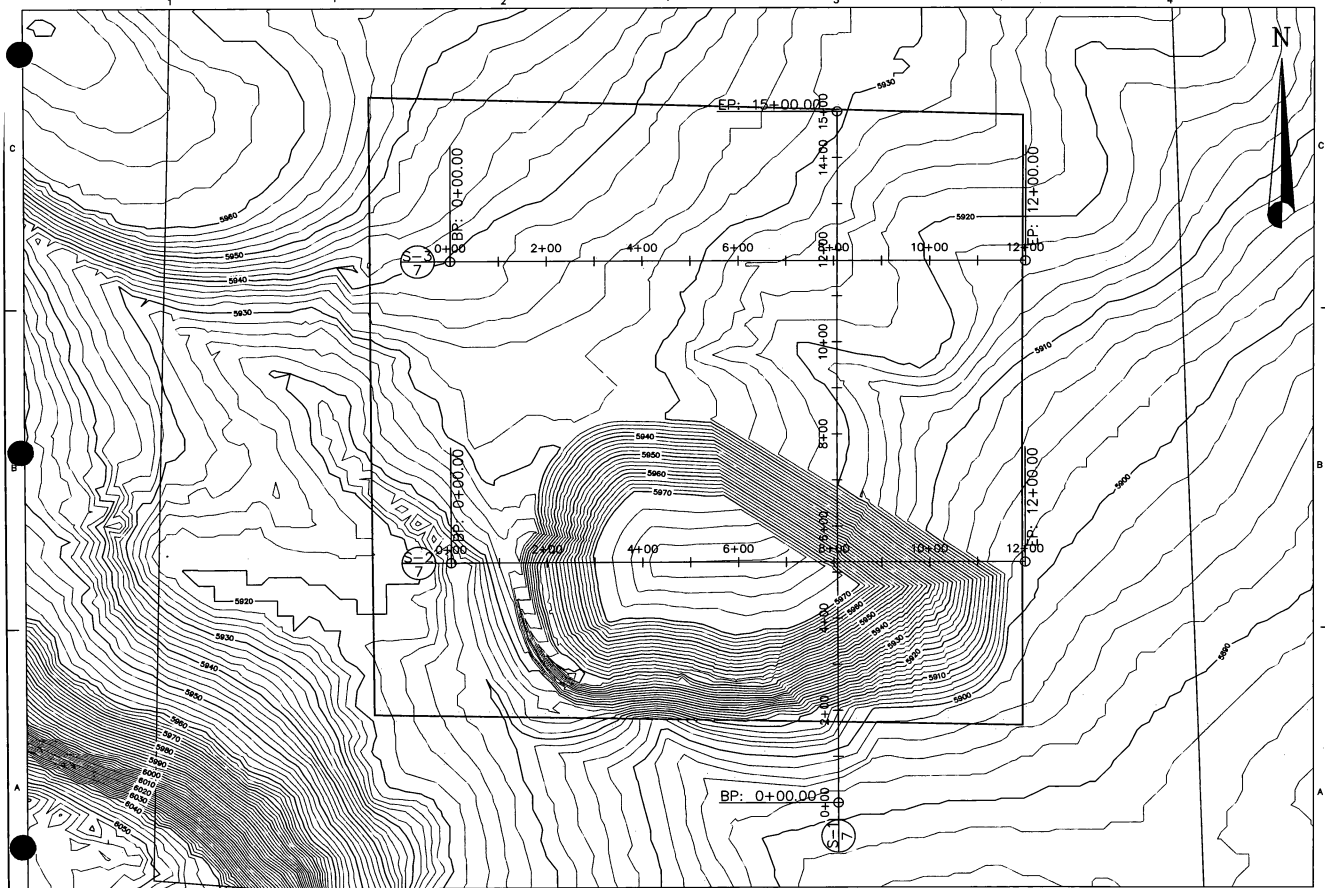
GENERAL ARRANGEMENT

2



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PHASE I DEVELOPMENT

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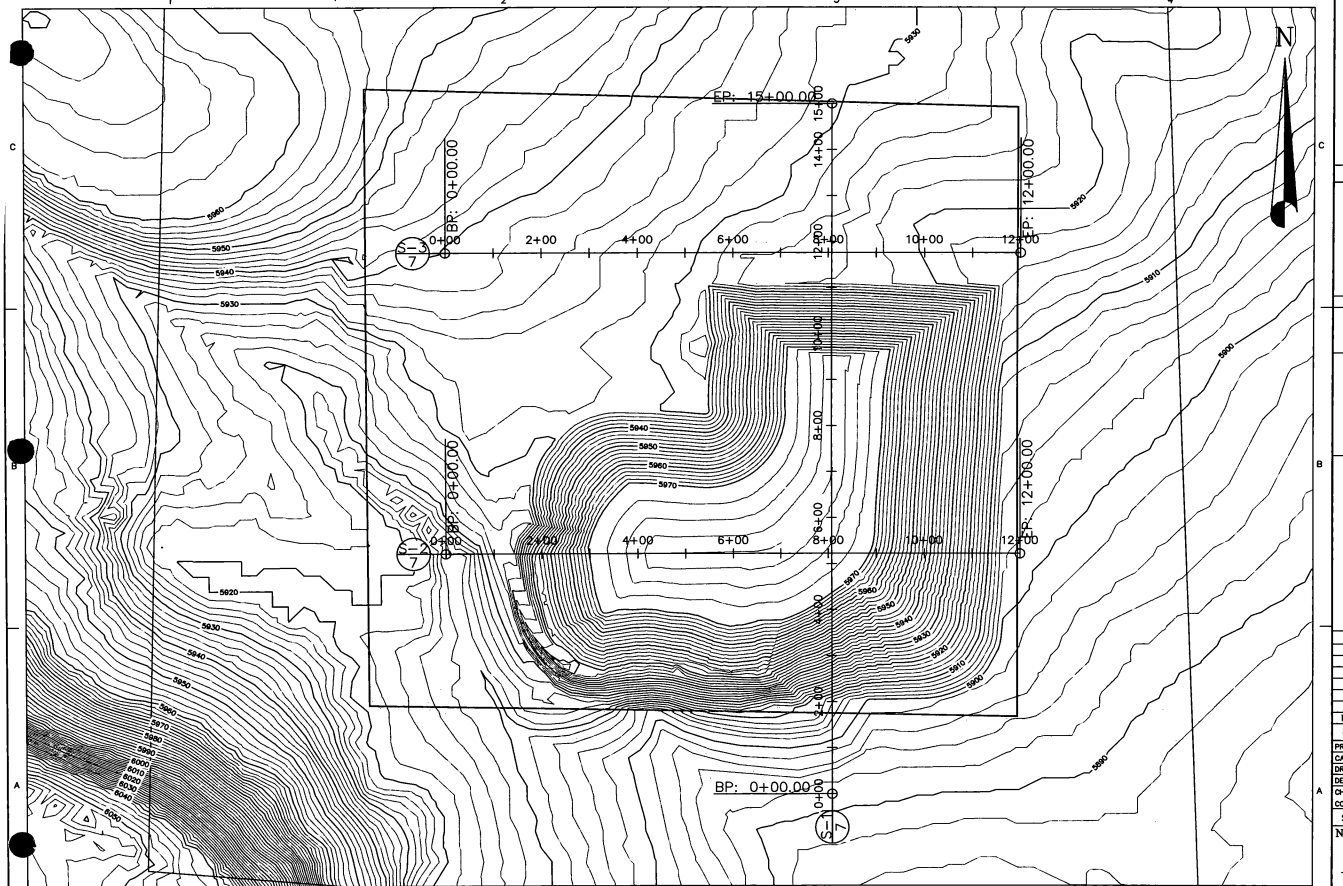

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PHASE II DEVELOPMENT

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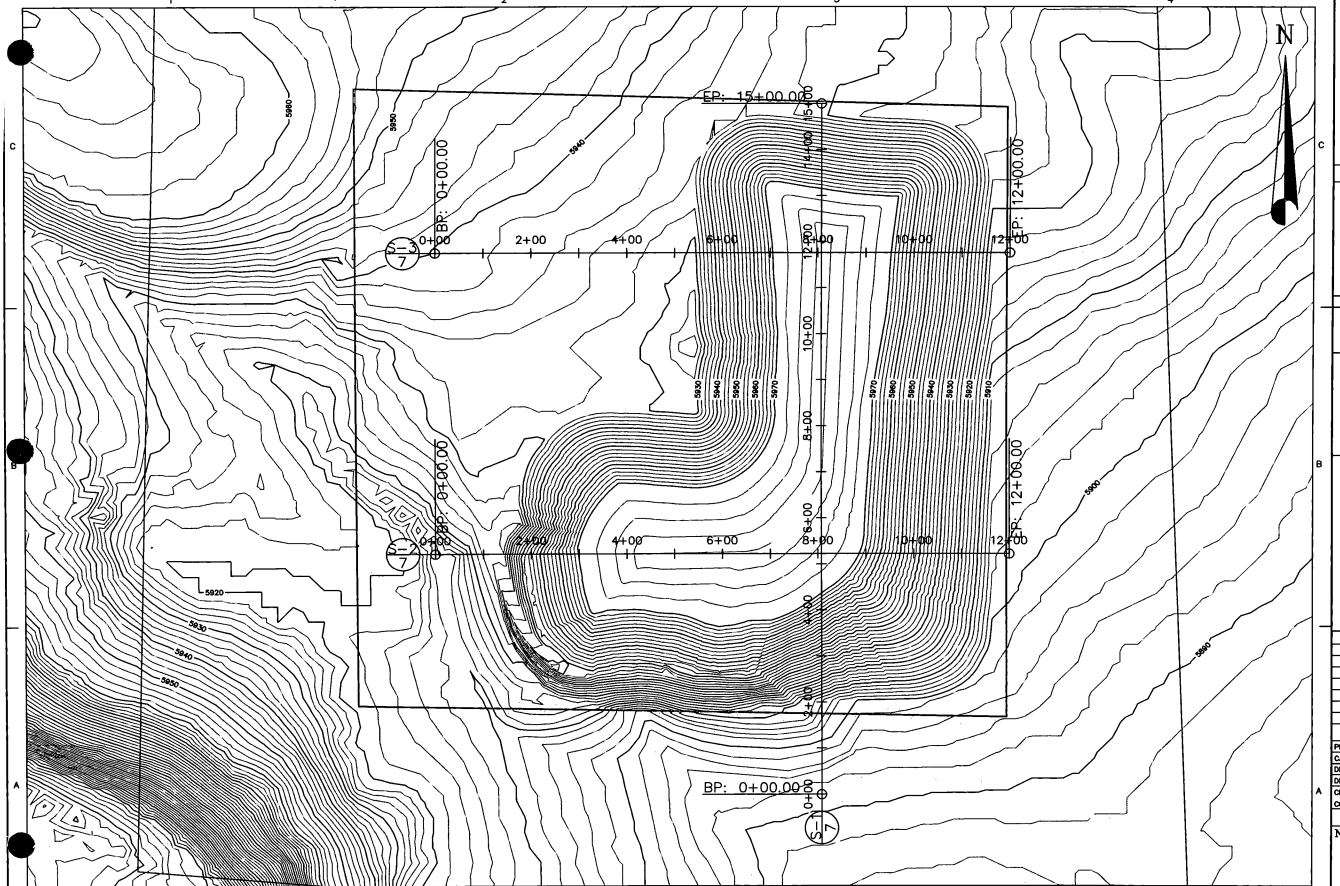

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0 50 100 200 300
SCALE IN FEET
2' CONTOUR INTERVAL SHOWN

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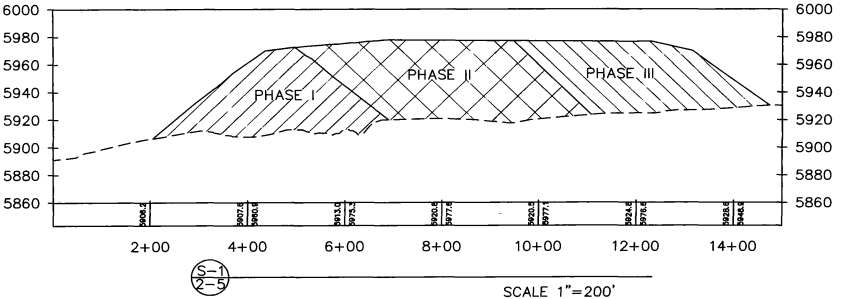
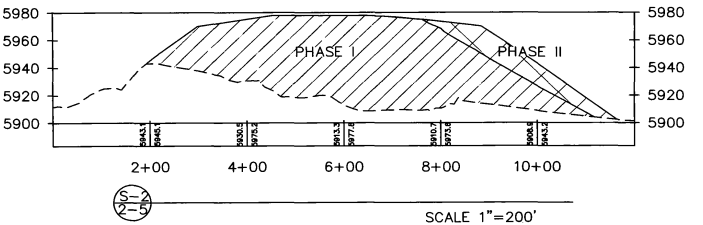
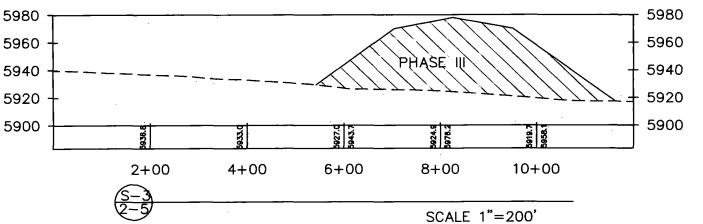
PHASE III DEVELOPMENT







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0 50 100 200 300
SCALE IN FEET

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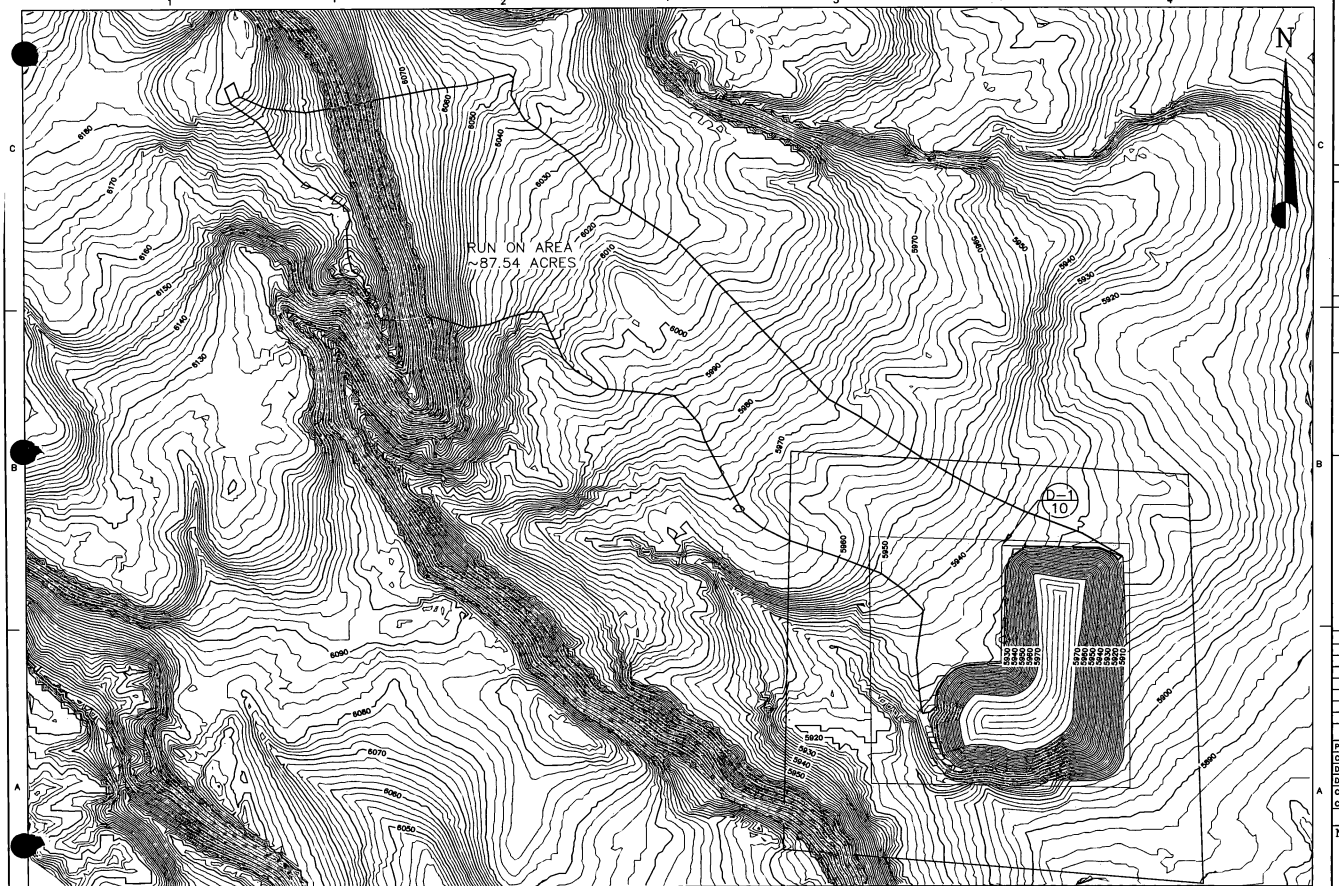
PROFILE VIEWS

6



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SITE BOUNDARY

POTENTIAL RUN-ON AREA

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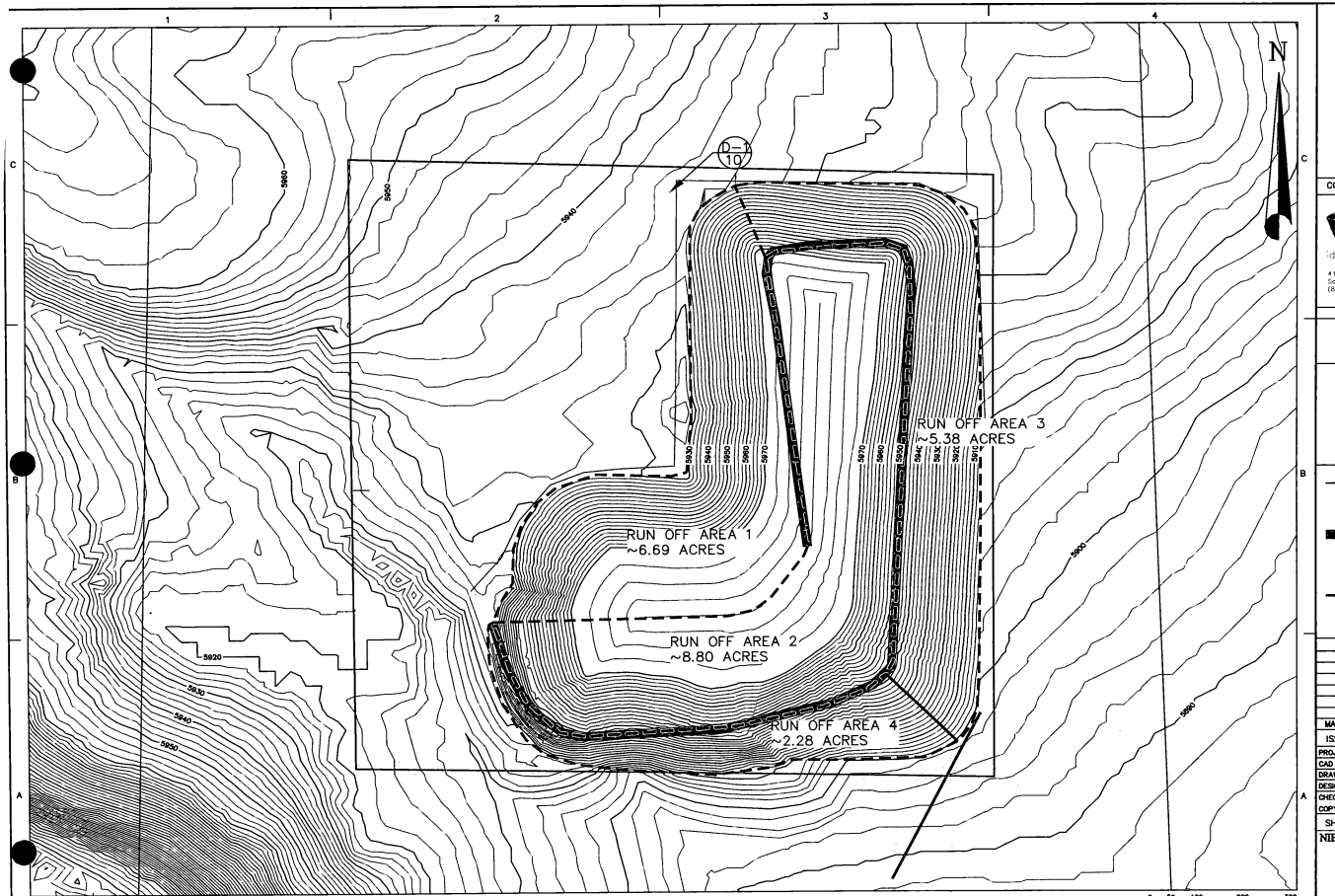
RUN ON HYDROLOGY

7



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SITE BOUNDARY

ACCESS ROAD/ DRAINAGE DITCH

FINAL CAP DRAINAGE SUB-AREAS

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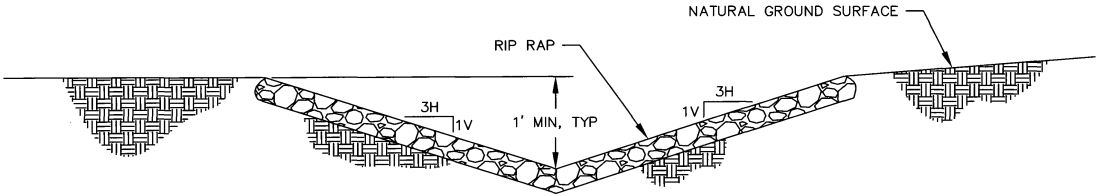
RUN OFF HYDROLOGY



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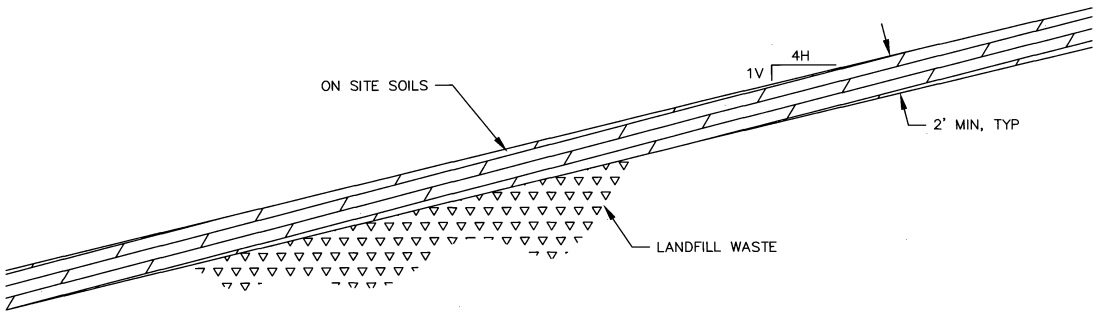
TYPICAL WATER DIVERSION CHANNEL

SCALE 1"=1"



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TYPICAL LANDFILL COVER

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TYPICAL DETAILS

9

457

WARRANTY DEED

RONALD J. BARNEY AND DIANE J. BARNEY

grantor of FERRON, County of EMERY, State of Utah, hereby convey and warrant to

NIELSON CONSTRUCTION

of P.O. BOX 620, HUNTINGTON, UTAH 84528 for the sum of $10.00 and other adequate considerations, the following described tract of land in EMERY County, State of Utah:

BEGINNING 660 FEET EAST OF THE NORTHWEST CORNER OF SE1/4NE1/4, SECTION 16, TOWNSHIP 18 SOUTH, RANGE 8 EAST, SLB&M; THENCE EAST 660 FEET; THENCE SOUTH 1320 FEET; THENCE WEST 1320 FEET; THENCE NORTH 660 FEEET; THENCE EAST 660 FEET; THENCE NORTH 660 FEET POINT OF BEGINNING

WITH A 50 FOOT RIGHT OF WAY BEING DESCRIBED AS FOLLOWS:
BEGINNING AT THE NORTHWEST CORNER OF SE1/4NE1/4 SECTION 16, TOWNSHIP 18 SOUTH, RANGE 8 EAST SLB&M; THENCE EAST 660 FEET; THENCE SOUTH 50 FEET; THENCE WEST 610 FEET; THENCE SOUTH 610 FEET; THENCE WEST 50 FEET; THENCE NORTH 660 FEET TO POINT OF BEGINNING

SUBJECT TO THE 1991 TAXES AND SUBSEQUENT YEARS

WITNESS the hands of said grantor, this 13TH day of FEBRUARY, 1991.

Ronald J. Barney
RONALD J. BARNEY
Diane J. Barney
DIANE J. BARNEY

STATE OF UTAH)
: ss
COUNTY OF EMERY)

On the 13TH, day of FEBRUARY, 1991, personally appeared before me RONALD J. BARNEY AND DIANE J. BARNEY the signers of the foregoing instrument, who duly acknowledged to me that they executed the same.

James R. Bartorelli
NOTARY PUBLIC.

My commission expires: 10-17-93 Address: CASTLE DALE, UTAH

NOTARY PUBLIC
Commission Expires
October 17, 1993
JAMES R. BARTORELLI
161 East Main Street
Castle Dale, Utah 84513

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TY OF EMERY S S
ND RECORDED FOR
13 PM 2 51
K 186
457
Y RECORDER

NIELSON CONSTRUCTION LANDFILL
DAILY LOG

Date	Company/Hauler Name	Vehicle License #	Time	Estimated Weight	Load Description	Initials

FILE: A:\DAILYLOG.FRM

NIELSON CONSTRUCTION LANDFILL
INSPECTION FORM

Performed by _____ Date: _____

Signature: _____

	Overall Condition	
	Satisfactory	**Needs Work***
I. Structures and Roads		
1. Buildings	_____	_____
2. Fences	_____	_____
3. Gates	_____	_____
4. Roads		

*Specify recommended repairs and/or list actions taken: _____

II. Operations		
1. Litter and Weed Control	_____	_____
2. Landfill Units	_____	_____
3. Daily Cover	_____	_____
4. Intermediate Cover	_____	_____
5. Final Cover	_____	_____
6. Segregated Waste Areas		
a. Scrap Metal/Appliances	_____	_____
b. Other_____	_____	_____

*Specify recommended repairs and/or list actions taken: _____

EQUIPMENT CHECKLIST

Walk around the rig and look for signs of wear, damage, or leaks before start up. Remember, even if everything looked fine last night, something could have happened in the mean time.

Use your intuition as you run through your check list and evaluate the machine's general condition. Operating an improperly running rig invites serious property damage and loss of time or well-being.

ITEM	REMARKS	DATE	INITIALS
Fluid Levels Indicate which-- Hydraulic Crankcase Oil Radiator Coolant Transmission Oil			
Tracks/Tread/Tires (wear or damage)			
Screens and Filters (check for clogging)			
Undercarriage			
Fuel Pressure Gauge			
Track Roller Collar, Bolts, Track Shoe Bolts			
Turbocharger, Manifold, and Air Cleaner Connections			
Joints in Drive Case			
Sprocket Hub Seals			

Operator Name _____ Signature _____

Nielson Construction LANDFILL
Random Load Inspection Record

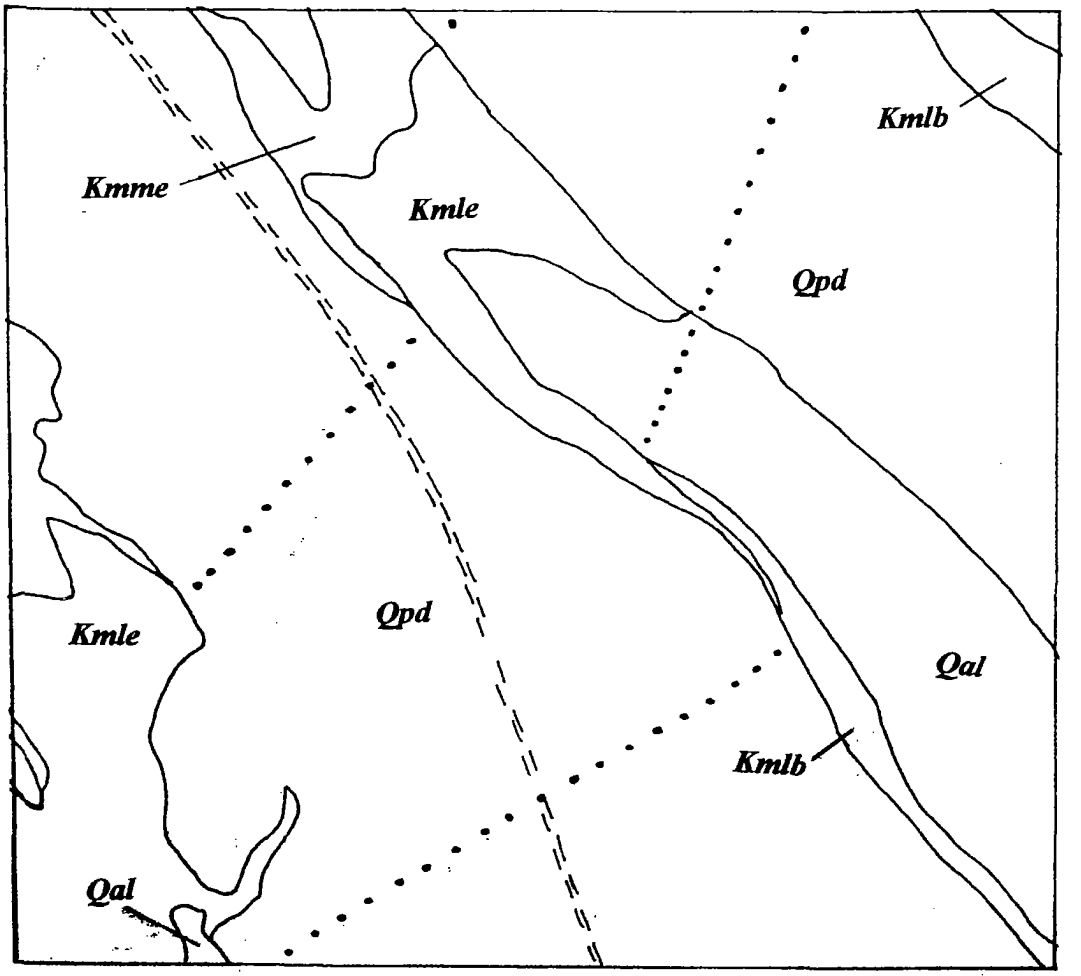
INSPECTION INFORMATION	
Inspector's Name:	
Date of Inspection:	
Time of Inspection:	
TRANSPORTATION COMPANY INFORMATION	
Company Name:	Nielson Construction Company
Address:	850 No. Loop Road P.O. Box 620
	Huntington, Utah 84528
Phone Number:	(435) 687-2494
VEHICLE INFORMATION	
Driver's Name:	
Vehicle Type:	
Vehicle License Number:	
Vehicle Contents:	
OBSERVATIONS AND ACTIONS TAKEN	
Photo Documentation: o Yes o No	

Driver's Signature*: _____ Date: _____

Inspector's Signature: _____ Date: _____

*Driver's signature hereon denotes: His presence during the inspection and does not admit, confirm or identify liability.

GENERALIZED GEOLOGIC MAP
ATTACHMENT #20



SOUTH EAST 1/4 OF THE NORTH EAST 1/4 OF SECTION 16, TOWNSHIP 18 SOUTH, RANGE 8 EAST SALT LAKE BASE & MERIDIAN

Legend:

Qal *Quaternary Alluvium--sand and gravel in wash channels*
Qpd *Quaternary Pediment Deposits--sand and gravel mantling ridge tops*
Kmle *Lower Part of Emery Sandstone member of the Mancos Shale*
Kmlb *Lower Part of the Blue Gate Member of the Mancos Shale*
Kmme *Middle Part of Emery Sandstone Member*
═══ *Road*
.... *Possible Fault*

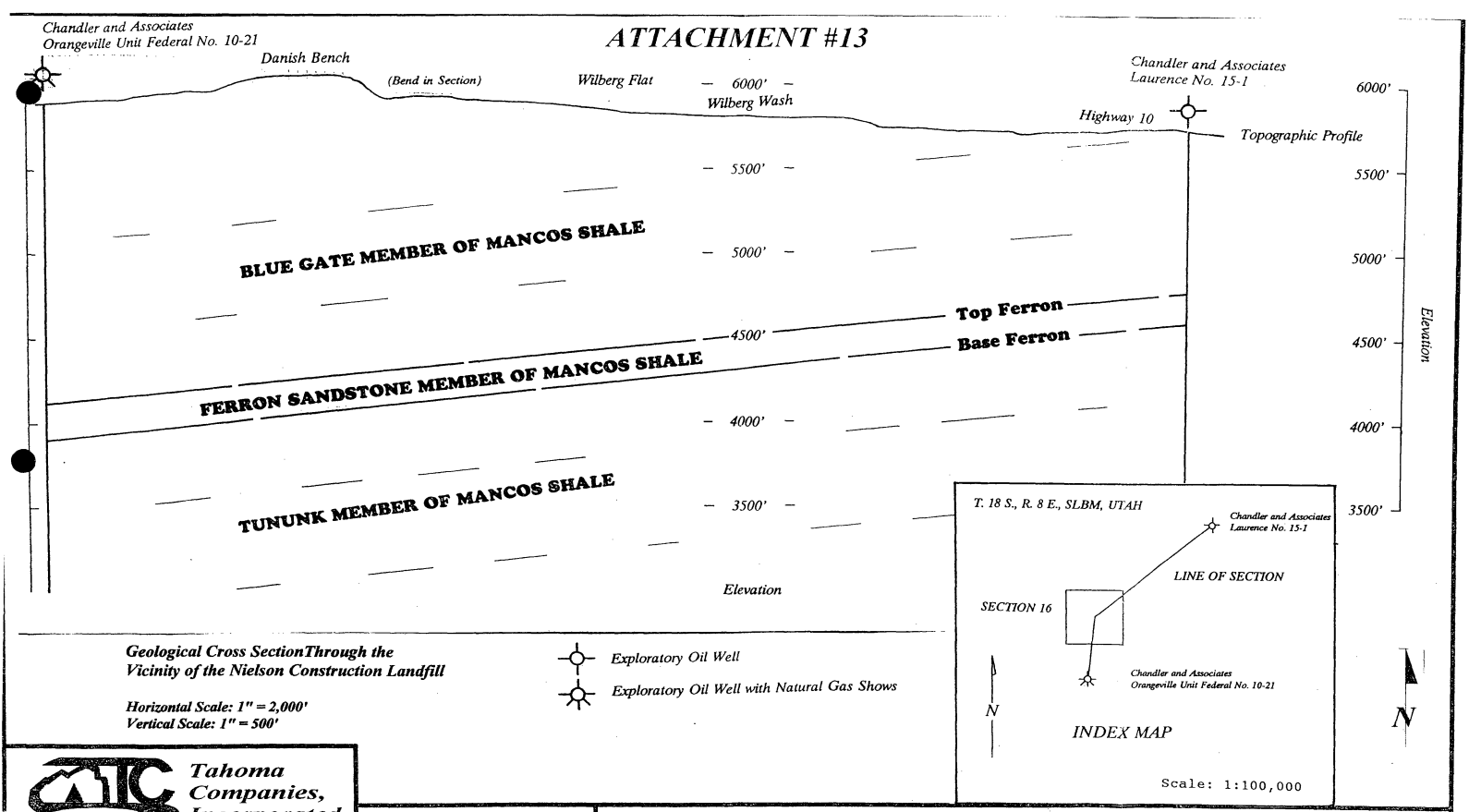
Scale: 1" = 12,000' (approximate--xerographically reproduced)
From Ellis and Frank, 1981.

Tahoma Companies, Incorporated
444 South Main, Suite C-7
Cedar City, Utah 84720
Phone: (435)865-0131 Fax: (435)865-0161

Date: December 16, 1997	
GEOLM.TCW	
Scale: 1" = 12,000'	
Drawn by: G. Hatch	
Tahoma Job No: 97018	

Nielson Construction Landfill
Castle Dale, Utah

ATTACHMENT #13



Geological Cross Section Through the Vicinity of the Nielson Construction Landfill

Horizontal Scale: 1" = 2,000'
Vertical Scale: 1" = 500'

Exploratory Oil Well

Exploratory Oil Well with Natural Gas Shows

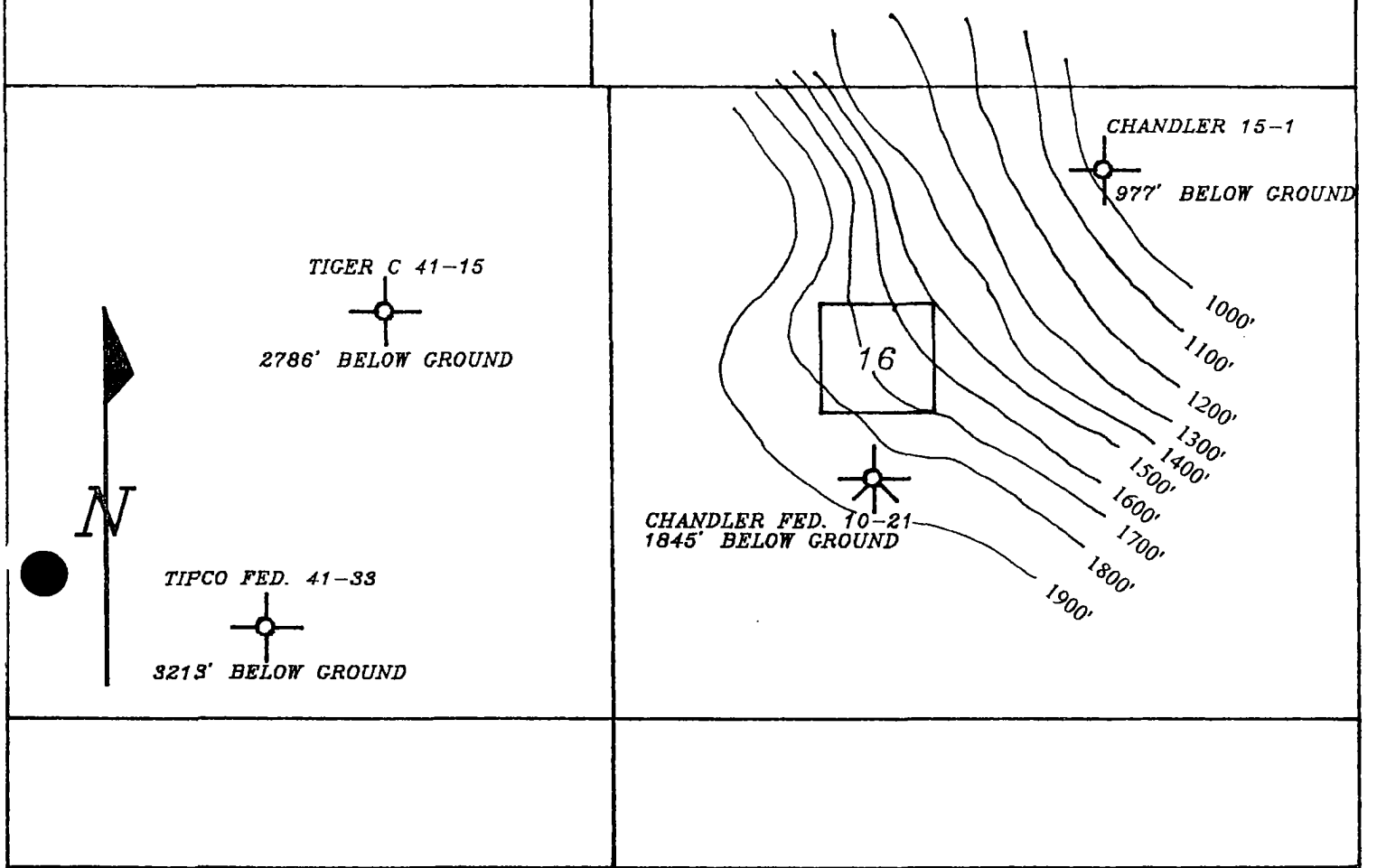
Tahoma Companies, Incorporated
444 South Main, Suite C-7
Cedar City, Utah 84720
Phone: (435)865-0131 Fax: (435)865-0161

Date: November 25, 1997
GEOLXS.TCW
Scales: Hor. 1"=2,000'; Vert. 1"=500'
Drawn by: G. Hatch
Job No. 97018

Nielson Construction
Castle Dale, Utah

THICKNESS OF BLUE GATE SHALE MEMBER OF THE MANCOS SHALE ABOVE THE FERRON SANDSTONE AQUIFER ATTACHMENT #12

N



ABANDONED EXPLORATORY WELL

ABANDONED EXPLORATORY WELL WITH GAS SHOW

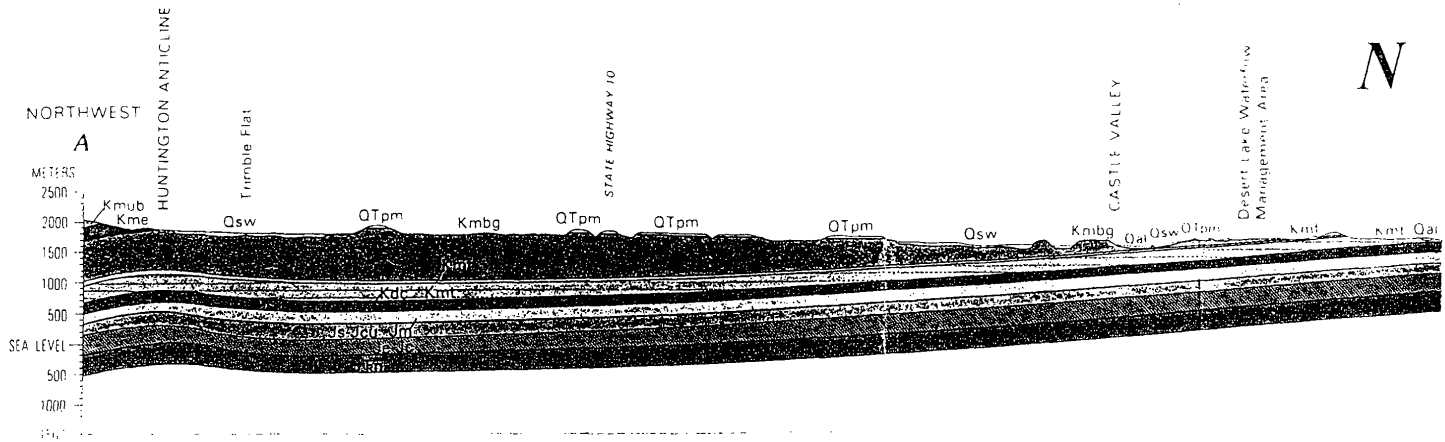
Scale = 1:100,000 (approximate--xerographically reproduced)

Tahoma Companies, Incorporated
444 South Main, Suite C-7
Cedar City, Utah 84720
Phone: (435)865-0131 Fax: (435)865-0161

Date: December 16, 1997	
THICK.TCW	
Scale: 1" = 100,000'	
Drawn by: G. Hatch	
Tahoma Job No: 97018	

Nielson Construction Landfill
Castle Dale, Utah

GEOLOGICAL CROSS SECTION OF
CASTLE VALLEY SHOWING REGIONAL
EXTENT OF THE BLUE GATE MEMBER OF
THE MANCOS SHALE
ATTACHMENT #11



Bearing: North 67 degrees West

Vertical & Horizontal Scales = 1:100,000

Legend:

Qsw	*Quaternary Sand in Washes*
Qtpm	*Quaternary and Late Tertiary Pediment sand and gravel*
Kme	*Emery Sandstone Member of the Mancos Shale*
Kmbg	*Blue Gate Member of the Mancos Shale*
Kmf	*Ferron Sandstone Member of the Mancos Shale*

Tahoma Companies, Incorporated
444 South Main, Suite C-7
Cedar City, Utah 84720
Phone: (435)865-0131 Fax: (435)865-0161

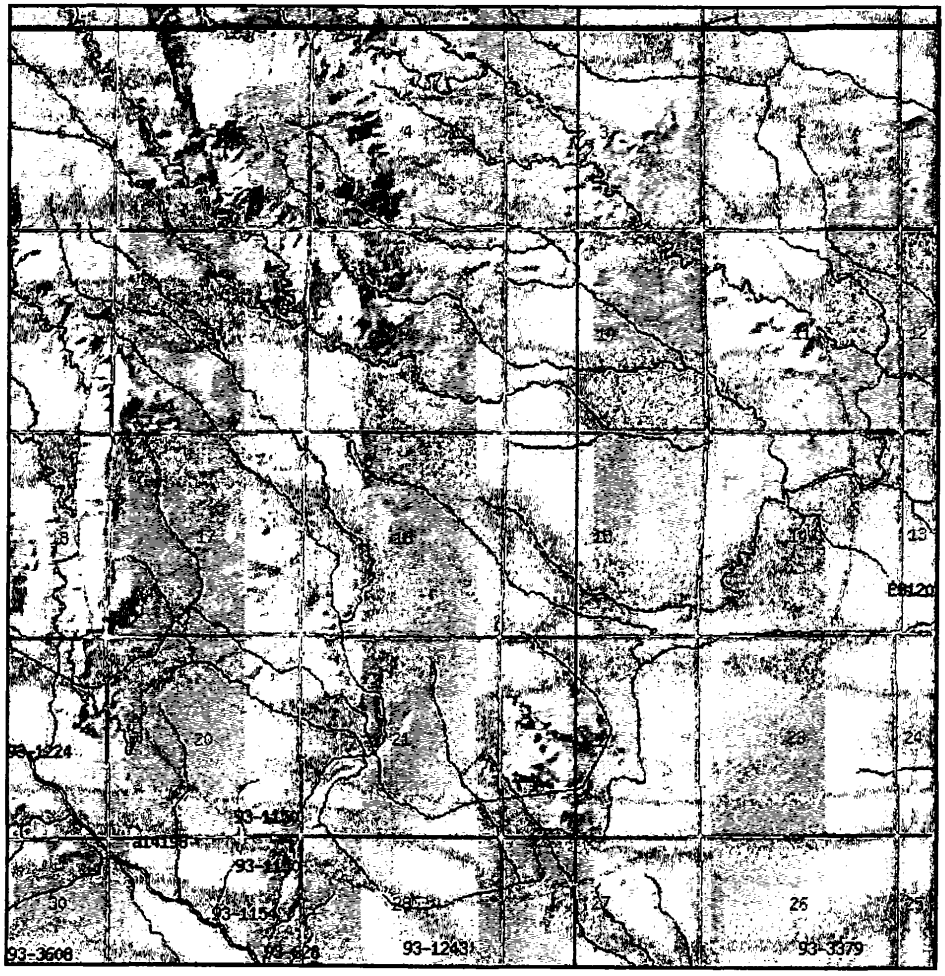
Date: December 17, 1997
GEOLXS.TCW
Scales = 1:100.00
Drawn by: G. Hatch
Job No. 97018

Nielson Construction Landfill
Castle Dale, Utah

WRPLAT Program Output Listing

Version: 2007.04.13.01 Rundate: 02/06/2008 01:49 PM

Radius search of 10560 feet from a point N941.90 W1071.88 from the E4 corner, section 16, Township 18S, Range 8E, SL b&m
Criteria:wrtypes=W,C,E podtypes=all status=U,A,P usetypes=all


93-3608
93-1243
93-3379
93-1224
0 1600 3200 4800 6400 ft

Water Rights

WR Number	Diversion Type/Location	Well Log	Status	Priority	Uses	CFS	ACFT	Owner Name
93-1215	Point to Point S660 E660 NW 19 18S 8E SL		P	18750000	S	0.000	0.000	JAMES L. AND DIXIE FIELDER P. O. BOX 321
93-1216	Point to Point N1380 E660 W4 19 18S 8E SL		P	18750000	S	0.000	0.000	CLEO AND LELAND DAVIS ORANGEVILLE UT 84537
93-1217	Point to Point N660 E1980 W4 19 18S 8E SL		P	18750000	S	0.000	0.000	RAYMOND & KATHERN HAMMERLEE BOX 362
93-1218	Point to Point N720 E1520 W4 19 18S 8E SL		P	18750000	S	0.000	0.000	PRESTON HUNTINGTON BOX 247
93-1219	Point to Point N680 E1600 W4 19 18S 8E SL		P	18750000	S	0.000	0.000	GEORGE L. & JEAN C. OLSEN ORANGEVILLE UT 84537
93-1220	Point to Point N220 E2050 W4 19 18S 8E SL		P	18750000	S	0.000	0.000	RAYMOND & KATHERN HAMMERLEE BOX 362
93-1221	Point to Point N100 E2050 W4 19 18S 8E SL		P	18750000	S	0.000	0.000	ELVA AND GEORGE KILLIAN 762 NORTH 100 WEST
93-1222	Point to Point S660 W1980 E4 19 18S 8E SL		P	18750000	S	0.000	0.000	GEORGE L. & JEAN C. OLSEN ORANGEVILLE UT 84537
93-1223	Point to Point		P	18750000	S	0.000	0.000	RAYMOND & KATHERN HAMMERLEE

	N2190 E100 S4 19 18S 8E SL					BOX 362
93-1224	Point to Point	P	18750000 S	0.000	0.000	LEONORA LUKE
	N660 W660 SE 19 18S 8E SL					ORANGEVILLE UT 84537
93-1225	Point to Point	P	18750000 S	0.000	0.000	GARY H. & DONNA DRAPER
	S660 W660 NE 30 18S 8E SL					13009 SOUTH 1700 WEST
93-1226	Point to Point	P	18750000 S	0.000	0.000	LEONORA LUKE
	S230 E2350 N4 30 18S 8E SL					ORANGEVILLE UT 84537
93-1227	Point to Point	P	18750000 S	0.000	0.000	OSDEN CHILDS
	S545 E2600 N4 30 18S 8E SL					ORANGEVILLE UT 84537
93-1228	Point to Point	P	18750000 S	0.000	0.000	GUY LAW
	S660 E660 NW 29 18S 8E SL					C/O WESLEY RUANE LAW
93-1229	Point to Point	P	18750000 S	0.000	0.000	BELLE ROSE HUNT
	S710 E340 NW 29 18S 8E SL					1271 KATHERYN STREET
93-1230	Point to Point	P	18750000 S	0.000	0.000	HAROLD CRAIG WINTERS
	N660 E660 W4 29 18S 8E SL					274 NORTH 300 WEST
93-1231	Point to Point	P	18750000 S	0.000	0.000	WILLIAM LYMAN AND CORA CURTIS
	N660 E1980 W4 29 18S 8E SL					ORANGEVILLE UT 84537
93-1232	Point to Point	P	18750000 S	0.000	0.000	CARL F. AND DARLENE LABBEE
	N1000 E1360 W4 29 18S 8E SL					ORANGEVILLE UT 84537
93-1233	Point to Point	P	18750000 S	0.000	0.000	WILLIAM K. & MARY H. HOUSEKEEPER

	N850 E1550 W4 29 18S 8E SL					C/O KENT HOUSEKEEPER, 308 EAST CENTER
93-1234	Point to Point	P	18750000 S	0.000	0.000	WILLIAM C. & LOIS E. WOLLEN
	N0 W2120 E4 29 18S 8E SL					ORANGEVILLE UT 84537
93-1236	Point to Point	P	18750000 S	0.000	0.000	RUFUS AND ALICE ALBRECHTSON
	N470 E2060 W4 29 18S 8E SL					ORANGEVILLE UT 84537
93-1237	Point to Point	P	18750000 S	0.000	0.000	CLARENCE E. GRANGE
	N370 E2200 W4 29 18S 8E SL					ORANGEVILLE UT 84537
93-1238	Point to Point	P	18750000 S	0.000	0.000	DANIEL D. AND JANICE LARA
	S1980 E660 N4 29 18S 8E SL					ORANGEVILLE UT 84537
93-1239	Point to Point	P	18750000 S	0.000	0.000	DONALD AND DELORES CURTIS
	N320 W2430 E4 29 18S 8E SL					ORANGEVILLE UT 84537
93-1240	Point to Point	P	18750000 S	0.000	0.000	JAY VON AND LORRAINE FRANDSEN
	S660 W660 E4 29 18S 8E SL					P.O. BOX 848
93-1241	Point to Point	P	18750000 S	0.000	0.000	KARL A. SEELY INCORPORATED
	S920 W1110 E4 29 18S 8E SL					C/O MONTELL SEELY
93-1242	Point to Point	P	18750000 S	0.000	0.000	KARL A. SEELY INCORPORATED
	N660 W660 SE 29 18S 8E SL					C/O MONTELL SEELY
93-1243	Point to Point	P	18750000 S	0.000	0.000	JAY VON AND LORRAINE H. FRANDSEN

	N660 E660 SW 28 18S 8E SL					P.O. BOX 848
93-3379	Point to Point	P	18750000 S	0.000	0.000	PRICE FIELD OFFICE USA BUREAU OF LAND MANAGEMENT
	S660 W660 NE 26 18S 8E SL					125 SOUTH 600 WEST
93-3608	Point to Point	P	18740000 S	0.000	0.280	CARL F. LABBEE
	S660 E660 N4 30 18S 8E SL					620 WEST 300 NORTH
93-1018	Surface	P	19460130 DIMSP	50.000	0.000	COTTONWOOD CREEK CONSOLIDATED IRRIGATION COMPANY
	N230 W680 SE 19 18S 8E SL					P O BOX 678
93-1020	Surface	P	19470423 DIMSP	37.250	0.000	COTTONWOOD CREEK CONSOLIDATED IRRIGATION COMPANY
	N230 W680 SE 19 18S 8E SL					P O BOX 678
93-1150	Surface	P	18990000 IS	1.000	0.000	GEORGIA H. GARDNER
	N840 E800 S4 20 18S 8E SL					ORANGEVILLE UT 84537
93-1150	Surface	P	18990000 IS	1.000	0.000	GEORGIA H. GARDNER
	S430 E860 N4 29 18S 8E SL					ORANGEVILLE UT 84537
93-1154	Surface	P	18900304 IS	0.250	0.000	DANIEL D. LARA
	S1700 E250 N4 29 18S 8E SL					ORANGEVILLE UT 84537
93-2178	Surface	P	18770000 DIMSP	103.113	0.000	COTTONWOOD CREEK CONSOLIDATED IRRIGATION COMPANY
	N230 W680 SE 19					P O BOX 678

	18S 8E SL					
93-2179	Surface	P	18790000 DIMSP	39.066	0.000	COTTONWOOD CREEK CONSOLIDATED IRRIGATION COMPANY
	N230 W680 SE 19 18S 8E SL					P O BOX 678
93-2180	Surface	P	18840000 DIMSP	8.333	0.000	COTTONWOOD CREEK CONSOLIDATED IRRIGATION COMPANY
	N230 W680 SE 19 18S 8E SL					P O BOX 678
93-521	Underground	U	19740820 IS	1.000	0.000	EMERY COUNTY WATER CONSERVANCY DISTRICT
	N1800 W800 SE 14 18S 8E SL					CASTLE DALE UT 84513
93-628	Surface	P	19020000 IS	1.000	0.000	JAY VON AND LORRAINE FRANDSEN
	S90 W1040 E4 29 18S 8E SL					P.O. BOX 848
93-921	Surface	P	19120111 DIMSP	20.000	0.000	COTTONWOOD CREEK CONSOLIDATED IRRIGATION COMPANY
	N230 W680 SE 19 18S 8E SL					P O BOX 678
a14197	Rediversion	A	19870206 IMOS	0.000	117.546	USA BUREAU OF RECLAMATION
	N230 W680 SE 19 18S 8E SL					ATTN: JONATHAN JONES
a14198	Rediversion	A	19870206 IMO	0.000	100000.000	USA BUREAU OF RECLAMATION
	N230 E680 SE 19 18S 8E SL					ATTN: JONATHAN JONES
E3120	Surface	A	18770000 I	0.000	287.000	WAYNE R. WILBERG

N1420 W340 SE 14
18S 8E SL

P.O. BOX 521

```
**********************************************************************************
**********************************************************************************
**                                                                              **
**                                                                              **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                   **
**                 HELP MODEL VERSION 3.04   (13 MARCH 1995)                    **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY                      **
**                     USAE WATERWAYS EXPERIMENT STATION                        **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                              **
**                                                                              **
**********************************************************************************
**********************************************************************************


PRECIPITATION DATA FILE:     C:\HELP3\CASTLE.D4
TEMPERATURE DATA FILE:       C:\HELP3\CASTLE.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\CASTLE.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\CASTLE.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\NIEL25S.D10
OUTPUT DATA FILE:            C:\HELP3\niel25o.OUT


TIME:  10:34     DATE:  12/17/1997

**********************************************************************************

     TITLE:  NIELSON CONSTRUCTION LANDFILL:

     (MOISTURE CONTENT DETERMINED AFTER LANDFILL OPEN FOR 5 YEARS,
     THEN RUN FOR 25 YEARS AFTER LANDFILL CLOSED.)

**********************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
            WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER   7
          THICKNESS                     =      6.00   INCHES
          POROSITY                      =      0.4730 VOL/VOL
          FIELD CAPACITY                =      0.2220 VOL/VOL
          WILTING POINT                 =      0.1040 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.1200 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     = 0.520000001000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
               FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	18.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2400	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 4

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4370	VOL/VOL
FIELD CAPACITY	=	0.1050	VOL/VOL
WILTING POINT	=	0.0470	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0487	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.170000002000E-02	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 8

THICKNESS	=	48.00	INCHES
POROSITY	=	0.4630	VOL/VOL
FIELD CAPACITY	=	0.2320	VOL/VOL
WILTING POINT	=	0.1160	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1419	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.369999994000E-03	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 4

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4370	VOL/VOL
FIELD CAPACITY	=	0.1050	VOL/VOL
WILTING POINT	=	0.0470	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0978	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.170000002000E-02	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 8

THICKNESS	=	48.00	INCHES
POROSITY	=	0.4630	VOL/VOL
FIELD CAPACITY	=	0.2320	VOL/VOL
WILTING POINT	=	0.1160	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1528	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.369999994000E-03	CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 4

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4370	VOL/VOL
FIELD CAPACITY	=	0.1050	VOL/VOL
WILTING POINT	=	0.0470	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0978	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.170000002000E-02	CM/SEC

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 8

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4630	VOL/VOL
FIELD CAPACITY	=	0.2320	VOL/VOL
WILTING POINT	=	0.1160	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1533	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.369999994000E-03	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 150. FEET.

SCS RUNOFF CURVE NUMBER	=	88.80	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT

AREA PROJECTED ON HORIZONTAL PLANE	=	15.000	ACRES
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	5.040	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	10.524	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	7.230	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	26.462	INCHES
TOTAL INITIAL WATER	=	26.462	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
GRAND JUNCTION COLORADO

STATION LATITUDE	=	39.07	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	109	
END OF GROWING SEASON (JULIAN DATE)	=	293	
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.10	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	60.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	36.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	36.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	57.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR MILFORD UTAH

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.56	0.48	0.56	0.50	0.65	0.46
0.83	0.99	0.76	0.74	0.48	0.52

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR MILFORD UTAH

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.70	28.70	38.30	46.80	56.00	65.40
71.70	69.20	60.50	49.50	36.10	24.90

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GRAND JUNCTION COLORADO
AND STATION LATITUDE = 39.12 DEGREES

MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.25	0.38	0.56	0.53	0.10	0.36
	0.03	1.20	1.37	0.55	0.60	0.38
RUNOFF	0.000	0.002	0.023	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.095
EVAPOTRANSPIRATION	-1.985	0.424	0.537	0.530	0.100	0.360
	0.030	1.040	1.530	0.340	0.761	0.215
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003

ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.31	343579.500	100.00
RUNOFF	0.120	6516.397	1.90
EVAPOTRANSPIRATION	3.881	211301.719	61.50
PERC./LEAKAGE THROUGH LAYER 8	0.003747	204.047	0.06
CHANGE IN WATER STORAGE	2.306	125557.430	36.54
SOIL WATER AT START OF YEAR	26.462	1440877.000	
SOIL WATER AT END OF YEAR	28.768	1566434.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.095	0.00

MONTHLY TOTALS (IN INCHES) FOR YEAR 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.74	0.22	0.42	1.21	0.34	0.67
	0.92	1.06	0.15	1.39	1.45	0.53
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.507	0.572	0.264	1.131	0.575	0.670
	0.920	0.840	0.370	1.111	1.298	0.594
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003

ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.10	495494.969	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	8.852	482006.406	97.28
PERC./LEAKAGE THROUGH LAYER 8	0.003690	200.910	0.04
CHANGE IN WATER STORAGE	0.244	13287.434	2.68
SOIL WATER AT START OF YEAR	28.768	1566434.370	
SOIL WATER AT END OF YEAR	29.012	1579721.870	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.206	0.00

MONTHLY TOTALS (IN INCHES) FOR YEAR 3

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.85	0.43	0.33	0.15	1.78	0.49
	0.53	0.20	2.26	0.34	0.44	0.95
RUNOFF	0.000	0.006	0.007	0.000	0.000	0.000
	0.000	0.000	0.004	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.850	0.366	0.742	0.097	1.759	0.493
	0.487	0.310	2.229	0.376	0.440	0.393
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.75	476437.562	100.00
RUNOFF	0.018	968.398	0.20
EVAPOTRANSPIRATION	8.540	465029.937	97.61
PERC./LEAKAGE THROUGH LAYER 8	0.003634	197.864	0.04
CHANGE IN WATER STORAGE	0.188	10240.996	2.15
SOIL WATER AT START OF YEAR	29.012	1579721.870	
SOIL WATER AT END OF YEAR	28.643	1559626.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.557	30336.133	6.37
ANNUAL WATER BUDGET BALANCE	0.0000	0.346	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 4

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.17	0.14	0.26	0.76	1.58	0.4[illegible]
	0.55	1.13	1.19	0.51	0.31	0.52
RUNOFF	0.000	0.003	0.000	0.000	0.000	0.000
	0.000	0.000	0.007	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.727	0.134	0.220	0.803	1.485	0.555
	0.540	1.100	0.463	1.217	0.352	0.527
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.58	412731.062	100.00
RUNOFF	0.010	528.530	0.13
EVAPOTRANSPIRATION	8.124	442340.094	107.17
PERC./LEAKAGE THROUGH LAYER 8	0.003589	195.435	0.05
CHANGE IN WATER STORAGE	-0.557	-30333.193	-7.35
SOIL WATER AT START OF YEAR	28.643	1559626.750	
SOIL WATER AT END OF YEAR	28.640	1559459.620	
SNOW WATER AT START OF YEAR	0.557	30336.133	7.35
SNOW WATER AT END OF YEAR	0.003	170.044	0.04
ANNUAL WATER BUDGET BALANCE	0.0000	0.207	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION	0.33	0.64	0.67	0.35	0.89	0.61
	1.78	1.65	1.51	0.00	0.86	0.11
RUNOFF	0.000	0.000	0.001	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.145	0.696	0.734	0.418	0.800	0.654
	1.825	1.229	1.890	0.041	0.588	0.360
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.40	511830.031	100.00
RUNOFF	0.002	103.645	0.02
EVAPOTRANSPIRATION	9.379	510685.031	99.78
PERC./LEAKAGE THROUGH LAYER 8	0.003502	190.699	0.04
CHANGE IN WATER STORAGE	0.016	850.748	0.17
SOIL WATER AT START OF YEAR	28.640	1559459.620	
SOIL WATER AT END OF YEAR	28.659	1560480.370	
SNOW WATER AT START OF YEAR	0.003	170.044	0.03
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.089	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 6

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.87	0.24	0.69	0.19	0.18	0.30
	0.67	0.81	1.40	1.13	0.77	0.11

RUNOFF	0.000	0.020	0.055	0.000	0.000	0.000
	0.000	0.000	0.065	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.485	0.465	0.796	0.117	0.226	0.28
	0.667	0.854	1.326	0.982	0.723	0.314
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0003	0.0002	0.0003	0.0003	0.0003	0.0002
	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.36	400751.969	100.00
RUNOFF	0.140	7644.417	1.91
EVAPOTRANSPIRATION	7.241	394248.625	98.38
PERC./LEAKAGE THROUGH LAYER 8	0.002972	161.845	0.04
CHANGE IN WATER STORAGE	-0.024	-1302.655	-0.33
SOIL WATER AT START OF YEAR	28.659	1560480.370	
SOIL WATER AT END OF YEAR	28.635	1559177.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.251	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 7

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.13	0.68	0.46	0.18	1.17	0.4
	1.46	0.64	0.79	0.26	0.57	0.12
RUNOFF	0.000	0.001	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION	0.130	0.593	0.545	0.180	1.106	0.504
	1.460	0.575	0.855	0.260	0.499	0.106
PERCOLATION/LEAKAGE THROUGH	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
LAYER 8	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.90	375705.062	100.00
RUNOFF	0.001	71.834	0.02
EVAPOTRANSPIRATION	6.813	370959.594	98.74
PERC./LEAKAGE THROUGH LAYER 8	0.002378	129.461	0.03
CHANGE IN WATER STORAGE	0.082	4490.696	1.20
SOIL WATER AT START OF YEAR	28.635	1559177.750	
SOIL WATER AT END OF YEAR	28.718	1563668.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0010	53.462	0.01

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MONTHLY TOTALS (IN INCHES) FOR YEAR 8

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.26	0.34	0.57	0.47	1.18	0.00
	1.57	1.21	1.15	0.23	0.00	0.99
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.260	0.233	0.754	0.384	1.097	0.177
	1.570	1.114	1.246	0.196	0.034	0.474

PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0002 0.0002	0.0002 0.0002	0.0002 0.0001	0.0002 0.0002	0.0002 0.0001	0.0002 0.0001

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.97	433966.594	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	7.538	410430.656	94.58
PERC./LEAKAGE THROUGH LAYER 8	0.001905	103.748	0.02
CHANGE IN WATER STORAGE	0.430	23432.070	5.40
SOIL WATER AT START OF YEAR	28.718	1563668.370	
SOIL WATER AT END OF YEAR	28.684	1561866.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.463	25234.061	5.81
ANNUAL WATER BUDGET BALANCE	0.0000	0.117	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 9

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.14 0.98	0.66 1.12	0.40 0.23	0.11 0.00	2.73 0.12	0.00 0.43
RUNOFF	0.154 0.000	0.000 0.000	0.002 0.000	0.000 0.000	0.009 0.000	0.000 0.000
EVAPOTRANSPIRATION	0.140 0.877	0.526 1.222	0.865 0.173	0.138 0.057	2.666 0.093	0. 0.393
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0001 0.0001	0.0001 0.0001	0.0001 0.0001	0.0001 0.0001	0.0001 0.0001	0.0001 0.0001

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.92	376794.000	100.00
RUNOFF	0.165	8972.003	2.38
EVAPOTRANSPIRATION	7.207	392432.687	104.15
PERC./LEAKAGE THROUGH LAYER 8	0.001518	82.679	0.02
CHANGE IN WATER STORAGE	-0.454	-24693.303	-6.55
SOIL WATER AT START OF YEAR	28.684	1561866.500	
SOIL WATER AT END OF YEAR	28.675	1561369.000	
SNOW WATER AT START OF YEAR	0.463	25234.061	6.70
SNOW WATER AT END OF YEAR	0.019	1038.225	0.28
ANNUAL WATER BUDGET BALANCE	0.0000	-0.067	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.55	0.49	0.41	0.36	0.67	0.26
	1.92	0.45	0.17	1.03	1.81	0.92
RUNOFF	0.021	0.007	0.000	0.000	0.000	0.000
	0.018	0.000	0.000	0.000	0.001	0.000
EVAPOTRANSPIRATION	0.357	0.409	0.683	0.315	0.750	0.260
	1.902	0.142	0.353	0.460	0.984	0.511
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.04	492228.000	100.00
RUNOFF	0.047	2553.235	0.52
EVAPOTRANSPIRATION	7.128	388106.156	78.85
PERC./LEAKAGE THROUGH LAYER 8	0.001216	66.187	0.01
CHANGE IN WATER STORAGE	1.856	101073.727	20.53
SOIL WATER AT START OF YEAR	28.675	1561369.000	
SOIL WATER AT END OF YEAR	30.073	1637463.750	
SNOW WATER AT START OF YEAR	0.019	1038.225	0.21
SNOW WATER AT END OF YEAR	0.478	26017.197	5.29
ANNUAL WATER BUDGET BALANCE	0.0079	428.679	0.09

MONTHLY TOTALS (IN INCHES) FOR YEAR 11

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.21	0.41	0.54	0.58	0.08	1.06
	0.33	0.27	1.83	0.45	0.93	0.20
RUNOFF	0.003	0.118	0.026	0.000	0.000	0.000
	0.000	0.000	0.001	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.648	0.145	1.864	0.609	0.284	0.720
	0.689	0.273	1.331	0.964	0.794	0.297
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.89	375160.531	100.00
RUNOFF	0.148	8047.277	2.15
EVAPOTRANSPIRATION	8.619	469296.312	125.09
PERC./LEAKAGE THROUGH LAYER 8	0.000977	53.214	0.01
CHANGE IN WATER STORAGE	-1.881	-102435.359	-27.30
SOIL WATER AT START OF YEAR	30.073	1637463.750	
SOIL WATER AT END OF YEAR	28.669	1561045.620	
SNOW WATER AT START OF YEAR	0.478	26017.197	6.93
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0037	199.072	0.05

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MONTHLY TOTALS (IN INCHES) FOR YEAR 12

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.34	0.12	0.82	0.40	0.29	0.53
	1.79	1.92	0.00	0.07	0.82	0.17
RUNOFF	0.081	0.000	0.000	0.000	0.000	0.000
	0.029	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.406	0.801	1.030	0.391	0.299	0.530
	1.722	1.944	0.014	0.070	0.711	0.231
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.27	450301.531	100.00
RUNOFF	0.111	6024.522	1.34
EVAPOTRANSPIRATION	8.150	443750.344	98.55
PERC./LEAKAGE THROUGH LAYER 8	0.000795	43.274	0.01
CHANGE IN WATER STORAGE	0.009	483.216	0.11
SOIL WATER AT START OF YEAR	28.669	1561045.620	
SOIL WATER AT END OF YEAR	28.630	1558912.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.048	2616.400	0.58
ANNUAL WATER BUDGET BALANCE	0.0000	0.171	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 13

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.63	0.67	0.49	0.65	0.42	0.25
	0.58	0.90	0.54	0.06	0.70	0.58
RUNOFF	0.021	0.119	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.486	0.187	0.991	0.685	0.420	0.212
	0.521	0.997	0.540	0.060	0.369	0.575
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.47	352291.500	100.00

RUNOFF	0.140	7604.067	2.16
EVAPOTRANSPIRATION	6.042	328971.531	93.38
PERC./LEAKAGE THROUGH LAYER 8	0.000653	35.543	0.01
CHANGE IN WATER STORAGE	0.288	15680.278	4.45
SOIL WATER AT START OF YEAR	28.630	1558912.370	
SOIL WATER AT END OF YEAR	28.966	1577209.120	
SNOW WATER AT START OF YEAR	0.048	2616.400	0.74
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.081	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 14

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.06	0.82	0.13	0.09	0.21	0.22
	0.71	1.51	0.54	0.49	0.56	0.93
RUNOFF	0.000	0.198	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.005
EVAPOTRANSPIRATION	0.777	0.687	0.684	0.090	0.210	0.220
	0.710	1.510	0.540	0.490	0.551	0.629
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.27	395851.719	100.00
RUNOFF	0.203	11052.806	2.79

EVAPOTRANSPIRATION	7.098	386470.312	97.63
PERC./LEAKAGE THROUGH LAYER 8	0.000551	29.985	0.01
CHANGE IN WATER STORAGE	-0.031	-1701.502	-0.43
SOIL WATER AT START OF YEAR	28.966	1577209.120	
SOIL WATER AT END OF YEAR	28.750	1565410.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.185	10096.856	2.55
ANNUAL WATER BUDGET BALANCE	0.0000	0.101	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.42	0.18	0.65	0.30	0.01	0.16
	0.59	0.03	1.09	1.50	0.02	0.38
RUNOFF	0.000	0.000	0.034	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.605	0.152	0.751	0.313	0.010	0.160
	0.590	0.030	1.084	0.918	0.608	0.315
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.000(
	0.0000	0.0000	0.0000	0.0000	0.0000	0.000(

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	5.33	290218.500	100.00
RUNOFF	0.034	1845.603	0.
EVAPOTRANSPIRATION	5.536	301429.125	103.86
PERC./LEAKAGE THROUGH LAYER 8	0.000480	26.139	0.01

CHANGE IN WATER STORAGE	-0.240	-13082.484	-4.51
SOIL WATER AT START OF YEAR	28.750	1565410.750	
SOIL WATER AT END OF YEAR	28.695	1562425.120	
SNOW WATER AT START OF YEAR	0.185	10096.856	3.48
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.126	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 16

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.53	0.40	0.83	0.76	0.00	0.23
	0.44	0.15	0.58	1.27	0.00	0.12
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.011	0.000	0.000
EVAPOTRANSPIRATION	0.530	0.388	0.907	0.628	0.132	0.219
	0.340	0.148	0.624	0.682	0.645	0.095
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	5.31	289129.531	100.00
RUNOFF	0.011	588.814	0.20
EVAPOTRANSPIRATION	5.339	290700.812	100.54
PERC./LEAKAGE THROUGH LAYER 8	0.000437	23.791	0.01
CHANGE IN WATER STORAGE	-0.040	-2183.969	-0.76

SOIL WATER AT START OF YEAR	28.695	1562425.120	
SOIL WATER AT END OF YEAR	28.655	1560241.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.063	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 17

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.55	0.20	0.41	0.41	0.83	0.76
	1.06	0.28	0.33	0.63	0.02	0.74
RUNOFF	0.000	0.079	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.
EVAPOTRANSPIRATION	0.200	0.277	0.610	0.393	0.866	0.721
	0.973	0.400	0.335	0.630	0.020	0.517
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.22	338679.031	100.00
RUNOFF	0.079	4306.949	1.27
EVAPOTRANSPIRATION	5.942	323544.125	95.53
PERC./LEAKAGE THROUGH LAYER 8	0.000414	22.518	0.01
CHANGE IN WATER STORAGE	0.198	10805.359	3.1
SOIL WATER AT START OF YEAR	28.655	1560241.120	
SOIL WATER AT END OF YEAR	28.630	1558882.870	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.223	12163.576	3.59
ANNUAL WATER BUDGET BALANCE	0.0000	0.086	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 18

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.58	0.28	1.39	0.30	1.10	0.13
	1.65	1.05	0.11	0.76	0.47	0.28
RUNOFF	0.024	0.000	0.144	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.569	0.280	1.275	0.481	1.100	0.130
	1.076	1.597	0.137	0.699	0.497	0.260
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.10	441044.969	100.00
RUNOFF	0.168	9157.840	2.08
EVAPOTRANSPIRATION	8.100	441070.687	100.01
PERC./LEAKAGE THROUGH LAYER 8	0.000410	22.318	0.01
CHANGE IN WATER STORAGE	-0.169	-9205.679	-2.09
SOIL WATER AT START OF YEAR	28.630	1558882.870	
SOIL WATER AT END OF YEAR	28.684	1561840.750	
SNOW WATER AT START OF YEAR	0.223	12163.576	2.76

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.184	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 19

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.65	0.26	0.87	0.43	0.09	0.19
	2.20	0.02	0.24	2.11	0.31	0.59
RUNOFF	0.000	0.000	0.001	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.605	0.301	0.762	0.495	0.189	0.126
	1.489	0.794	0.192	0.970	0.772	0.671
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.96	433421.937	100.00
RUNOFF	0.001	53.475	0.01
EVAPOTRANSPIRATION	7.367	401144.437	92.55
PERC./LEAKAGE THROUGH LAYER 8	0.000422	22.958	0.01
CHANGE IN WATER STORAGE	0.590	32142.852	7.42
SOIL WATER AT START OF YEAR	28.684	1561840.750	
SOIL WATER AT END OF YEAR	29.274	1593983.620	
SNOW WATER AT START OF YEAR	0.000	0.000	0.0
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0011	58.215	0.01

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MONTHLY TOTALS (IN INCHES) FOR YEAR 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.14	0.56	0.55	0.24	0.97	0.93
	0.23	0.79	0.98	0.07	1.22	0.99
RUNOFF	0.000	0.089	0.097	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.117
EVAPOTRANSPIRATION	0.140	0.291	1.159	0.279	0.992	0.963
	0.167	0.821	0.614	0.490	0.779	0.577
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.67	417631.500	100.00
RUNOFF	0.304	16527.252	3.96
EVAPOTRANSPIRATION	7.272	395970.094	94.81
PERC./LEAKAGE THROUGH LAYER 8	0.000447	24.365	0.01
CHANGE IN WATER STORAGE	0.094	5109.776	1.22
SOIL WATER AT START OF YEAR	29.274	1593983.620	
SOIL WATER AT END OF YEAR	29.368	1599093.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.008	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 21

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.15	0.52	0.43	0.60	0.11	0.09
	0.20	1.90	0.69	0.00	0.17	0.14
RUNOFF	0.000	0.011	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.177	0.465	1.184	0.569	0.141	0.071
	0.181	1.937	0.595	0.095	0.125	0.142
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ANNUAL TOTALS FOR YEAR 21

	INCHES	CU. FEET	PERCENT
PRECIPITATION	5.00	272250.000	100.00
RUNOFF	0.011	580.684	0.21
EVAPOTRANSPIRATION	5.684	309489.969	113.68
PERC./LEAKAGE THROUGH LAYER 8	0.000481	26.217	0.01
CHANGE IN WATER STORAGE	-0.695	-37846.887	-13.90
SOIL WATER AT START OF YEAR	29.368	1599093.370	
SOIL WATER AT END OF YEAR	28.673	1561246.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.003	0.00

MONTHLY TOTALS (IN INCHES) FOR YEAR 22

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.80	0.30	0.32	0.20	0.70	0.15
	0.60	0.20	0.02	0.43	0.59	0.39
RUNOFF	0.002	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.547	0.462	0.317	0.252	0.782	0.072
	0.678	0.200	0.020	0.373	0.310	0.412
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ANNUAL TOTALS FOR YEAR 22

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.70	255915.016	100.00
RUNOFF	0.002	121.364	0.05
EVAPOTRANSPIRATION	4.424	240911.406	94.14
PERC./LEAKAGE THROUGH LAYER 8	0.000525	28.606	0.01
CHANGE IN WATER STORAGE	0.273	14853.568	5.80
SOIL WATER AT START OF YEAR	28.673	1561246.500	
SOIL WATER AT END OF YEAR	28.946	1576100.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.075	0.00

MONTHLY TOTALS (IN INCHES) FOR YEAR 23

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/
PRECIPITATION	0.83	0.27	0.89	0.91	0.19	0.44
	1.76	1.10	0.00	2.02	1.61	0.55
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.029	0.000	0.000
EVAPOTRANSPIRATION	0.830	0.374	0.853	1.052	0.295	0.399
	1.498	1.403	0.000	0.606	0.902	0.489
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001

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ANNUAL TOTALS FOR YEAR 23

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.57	575536.562	100.0
RUNOFF	0.030	1606.821	0.28
EVAPOTRANSPIRATION	8.702	473824.500	82.33
PERC./LEAKAGE THROUGH LAYER 8	0.000576	31.380	0.01
CHANGE IN WATER STORAGE	1.838	100074.062	17.39
SOIL WATER AT START OF YEAR	28.946	1576100.120	
SOIL WATER AT END OF YEAR	30.687	1670911.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.097	5262.428	0.91
ANNUAL WATER BUDGET BALANCE	0.0000	-0.234	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 24

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.56	0.69	0.37	0.59	0.65	1.08
	0.26	0.60	1.42	0.26	0.74	0.32
RUNOFF	0.000	0.056	0.000	0.000	0.000	0.026
	0.000	0.000	0.010	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.631	0.593	1.581	0.836	0.627	1.098
	0.853	0.359	1.131	0.663	0.417	0.356
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

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ANNUAL TOTALS FOR YEAR 24

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.54	410553.062	100.00
RUNOFF	0.092	4988.826	1.22
EVAPOTRANSPIRATION	9.145	497943.719	121.29
PERC./LEAKAGE THROUGH LAYER 8	0.000635	34.561	0.01
CHANGE IN WATER STORAGE	-1.697	-92414.125	-22.51
SOIL WATER AT START OF YEAR	30.687	1670911.750	
SOIL WATER AT END OF YEAR	29.087	1583760.000	
SNOW WATER AT START OF YEAR	0.097	5262.428	1.28
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.070	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 25

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION	0.11	0.57	0.39	0.96	0.51	0.02
	0.16	1.36	1.08	0.40	0.95	0.96
RUNOFF	0.000	0.005	0.000	0.000	0.000	0.
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.059	0.545	0.909	0.966	0.510	0.020
	0.160	1.257	0.686	0.780	0.469	0.704
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

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ANNUAL TOTALS FOR YEAR 25

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.47	406741.500	100.00
RUNOFF	0.005	255.588	0.06
EVAPOTRANSPIRATION	7.065	384693.687	94.58
PERC./LEAKAGE THROUGH LAYER 8	0.000694	37.798	0.0
CHANGE IN WATER STORAGE	0.400	21754.334	5.35
SOIL WATER AT START OF YEAR	29.087	1583760.000	
SOIL WATER AT END OF YEAR	29.261	1593264.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.225	12249.822	3.01
ANNUAL WATER BUDGET BALANCE	0.0000	0.077	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 25

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/
PRECIPITATION						
TOTALS	0.51	0.42	0.55	0.47	0.67	0.39

	0.92	0.86	0.79	0.64	0.64	0.50
STD. DEVIATIONS	0.33	0.20	0.26	0.29	0.66	0.31
	0.65	0.57	0.63	0.62	0.50	0.31
RUNOFF						
TOTALS	0.012	0.029	0.016	0.000	0.000	0.001
	0.002	0.000	0.003	0.002	0.000	0.009
STD. DEVIATIONS	0.034	0.052	0.035	0.000	0.002	0.005
	0.007	0.000	0.013	0.006	0.000	0.029
EVAPOTRANSPIRATION						
TOTALS	0.353	0.415	0.841	0.486	0.697	0.387
	0.877	0.884	0.731	0.541	0.550	0.406
STD. DEVIATIONS	0.543	0.183	0.376	0.297	0.614	0.294
	0.556	0.560	0.600	0.357	0.306	0.174
PERCOLATION/LEAKAGE THROUGH LAYER 8						
TOTALS	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
STD. DEVIATIONS	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 25

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.36 (1.434)	400969.9	100.00
RUNOFF	0.074 (0.0818)	4004.81	0.999
EVAPOTRANSPIRATION	7.167 (1.4488)	390270.06	97.332
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.00147 (0.00128)	79.822	0.01991
CHANGE IN WATER STORAGE	0.121 (0.9193)	6585.50	1.642

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 25

	(INCHES)	(CU. FT.)
PRECIPITATION	1.14	62073.000
RUNOFF	0.198	10804.4482
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.000010	0.56340
SNOW WATER	0.83	44976.3672

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3928
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2100

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FINAL WATER STORAGE AT END OF YEAR 25

LAYER	(INCHES)	(VOL/VOL)
1	1.3500	0.2250
2	6.5083	0.3616
3	0.6014	0.0501
4	6.8112	0.1419
5	0.5025	0.0838
6	7.4187	0.1546
7	0.5025	0.0838
8	5.5664	0.1546
SNOW WATER	0.225	

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CASTLE DALE CLIMATOLOGICAL DATA

County: Emery Lat: 39° 12' Long: 111°, 16' Elevation: 5619 feet Period: 1928-1992

Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Normal max temp	35.8	42.9	53.2	63.1	73.1	83.9	89.6	86.9	78.8	66.9	50.7	38.5	63.6
Normal min temp	7.6	14.5	23.3	30.4	38.9	46.9	53.8	51.4	42.3	32.0	21.6	11.3	31.2
Normal mena temp	21.7	28.7	38.3	46.8	56.0	65.4	71.7	69.2	60.5	49.5	36.1	24.9	47.4
Record high temp	62	70	81	85	91	100	103	101	95	87	74	64	103
Record low temp	-34	-35	3	12	18	25	35	32	22	3	-7	-28	-35
Normal pcpn	0.56	0.48	0.56	0.50	0.65	0.46	0.83	0.99	0.76	0.74	0.48	0.52	7.52
Record mly pcpn	1.96	1.69	1.93	1.96	2.73	2.01	3.21	3.27	3.68	3.65	2.68	1.74	3.68
Record dly pcpn	0.73	1.10	0.95	0.92	1.07	1.09	1.43	1.35	1.39	1.24	1.49	0.96	1.49
Normal snowfall	6.6	3.8	1.7	0.6	0.0	0.0	0.0	0.0	0.0	0.2	1.3	3.8	18.0
Record mly snow	24.5	19.9	7.0	6.0	4.0	0.0	0.0	0.0	0.0	4.0	12.1	18.4	24.5
Record dly snow	10.5	8.0	7.0	6.0	4.0	0.0	0.0	0.0	0.0	4.0	7.0	9.5	10.5
Evapotranspiration	0.79	1.31	2.69	4.21	6.05	7.58	8.16	7.05	4.94	3.03	1.42	0.84	48.07

*Percentage of period with data: 91% for temperature, 88% for precipitation, 84% for snowfall.

Reference: Ashcroft, G.L., Donald T. Jensen, and Jeffrey L. Brown, 1992, Utah Climate: Utah Climate Center, USU, Logan, Utah

Emery Co. locations standa

TAHOMA COMPANIES, INCORPORATED WDBE
444 S. MAIN STREET, SUITE C-7
CEDAR CITY, UTAH 84720
(801) 865 0131 FAX (801) 865 0161

April 5, 1994

Mr. Tom Gnojek
U.S. Bureau of Land Management
San Rafael River Resource Area
900 North 700 East
Price, Utah 84501

Dear Mr. Gnojek:

Thank you for your useful advice on wilderness and recreation land issues associated with landfill licensing given in our telephone conversation of Tuesday morning, April 5, 1994.

You and I briefly discussed the Emery County Landfill (ECL) near Castle Dale, Utah. The ECL is located on the western edge of Wilberg Flat in section 16, T. 18 S., R. 8 E., SLB&M. The landfill has been operating since 1984, but must now be licensed under new state regulations effective September, 1993. The area to be licensed is within a fenced, disturbed area, adjacent to an operating landfill cell.

You informed me that the ECL is not located within a designated wilderness or wilderness study area. You also assured me that the only wilderness or WSA in Emery County is east of Highway 10.

It is our opinion that the ECL will not impact wilderness or recreation areas.

Thanks again for the prompt advice from your agency. Tahoma Companies will soon be involved in license applications for several other Utah landfills. It is nice to know where we can get help on wilderness area issues so readily.

Sincerely,

Gary F. Player

Gary F. Player
Principal Geologist

File:TT8A\license\usblmltr

Emery
location
Standa

TAHOMA COMPANIES, INCORPORATED WDBE
444 S. MAIN STREET, SUITE C-7
CEDAR CITY, UTAH 84720
(801) 865 0131 FAX (801) 865 0161

March 31, 1994

USFW 524 3001

Mr. Robert Williams
U.S. Fish and Wildlife Service
2060 Administration Building
1745 West 1700 South
Salt Lake City, Utah 84104

Dear Mr. Williams:

Please thank Mr. Clark D. Johnson for his useful advice on Threatened and Endangered Species issues associated with landfill licensing given on Tuesday afternoon, March 29, 1994. At his suggestion, I have reviewed the USFWS list of Endangered, Threatened and Candidate Species in Utah by Latilong Block, dated September 24, 1992.

Clark and I briefly discussed the Emery County Landfill (ECL) near Castle Dale, Utah. The ECL is located on the western edge of Wilberg Flat in section 16, T. 18 S., R. 8 E., SLB&M. The landfill has been operating since 1984, but must now be licensed under new state regulations effective September, 1993. The area to be licensed is within a fenced, disturbed area, adjacent to an operating landfill cell.

Mr. Johnson informed me that the ECL is not located within a designated Critical Habitat Zone for any terrestrial species. He assured me that the only critical habitat officially recognized in Emery County is aquatic habitat identified for the Colorado River squawfish and the associated native fish community in most drainages of the Colorado, Green and San Juan river basins.

It is our opinion that the ECL will not impact aquatic habitats for the following reasons:

(1) The lands have been previously disturbed by old landfill operations; and

(2) No water courses or impoundments occur on the property.

At Mr. Clark's suggestion, I also contacted Mr. Larry England of your staff for further information on endangered, threatened and candidate plant species in Emery County. He (Mr. England) told me that critical habitat for listed or candidate plant species is not present at the Emery County Landfill.

Thanks again for the prompt advice from your agency personnel. Tahoma Companies will soon be involved in license applications for several other Utah landfills. It is nice to know where we can get help on biological issues so readily.

Sincerely,

Gary F. Player
Principal Geologist

Enclosure: Topographic Map of Emery County Landfill site.
File:TTBA\license\usfwsltr

Copy Emery Location Standar

TAHOMACOMPANIES,INCORPORATED WDBE
444 S. MAIN STREET, SUITE C-7
CEDARCITY, UTAH 84720
(801) 865 0131 FAX (801) 865 0161

March 30, 1994

Mr. Kyle "Jake" Jacobson
Utah Department of Agriculture
350 North Redwood Road
Salt Lake City, Utah 84116

Dear Jake:

Thank you for our beneficial discussion of Important Farmland issues associated with landfill licensing yesterday afternoon. At your suggestion, I have reviewed Utah Agricultural Experiment Station Research Report Number 76, "Important Farmlands of parts of Carbon, Emery, Grand and Sevier Counties." I have concluded that no classified "Important Farmlands" are present at the Emery County Landfill.

We briefly discussed the Emery County Landfill (ECL) near Castle Dale, Utah. The ECL is located on the western edge of Wilberg Flat in section 16, T. 18 S., R. 8 E., SLB&M. The landfill has been operating since 1984, but must now be licensed under new state regulations effective September, 1993. The area to be licensed is within a fenced, disturbed area, adjacent to an operating landfill cell.

Thank you again for a very productive meeting.

Sincerely,

Gary F. Player

Gary F. Player
Principal Geologist

Enclosure: Topographic Map of Emery County Landfill site.

File:TT8A\license\udagltr

State of Utah

Department of Community & Economic Development
Division of State History
Utah State Historical Society

Michael O. Leavitt
Governor
Max J. Evans
Director

300 Rio Grande
Salt Lake City, Utah 84101-1182
(801) 533-3500
FAX (801) 533-3503

April 12, 1994

Gary F. Player
Principal Geologist
Tahoma Companies, Incorporated WDBE
444 South Main Street, Suite C-7
Cedar City, Utah 84720

RE: Emery County Landfill (ECL)

In Reply Please Refer to Case No. 94-0450

Dear Mr. Player:

The Utah State Historical Preservation Office received the above referenced project on April 4, 1994. After review of the material provided, the Utah Preservation Office recommends that there would be **No Effect** upon cultural resources by the project.

If you have questions, please contact me at (801) 533-3555.

Sincerely,

Janice Reed Campbell for

James L. Dykmann
Compliance Archaeologist

JLD:94-0450 OR/NP/NE

TAHOMA COMPANIES, INCORPORATED
444 S. MAIN STREET, SUITE C-7
CEDAR CITY, UTAH 84720
(801) 865 0131 FAX (801) 865 0161

April 11, 1944

Mr. Dave Rodda
Aviation Safety Inspector
Federal Aviation Agency
116 N 2400 W
Salt Lake City, Utah 84116

Dear Mr. Rodda:

Thanks for your help in our efforts to obtain a license for the Emery County Landfill under new Utah state regulations. We spoke on the telephone a couple of weeks ago.

You and I briefly discussed the Emery County Landfill (ECL) near Castle Dale, Utah. The ECL is located on the western edge of Wilberg Flat in section 16, T. 18 S., R. 8 E., SLB&M. The landfill has been operating since 1984, but must now be licensed under new state regulations effective September, 1993. The area to be licensed is within a fenced, disturbed area, adjacent to an operating landfill cell.

After I told you the location of the landfill you provided me with the following information:

> The facility is not within ten thousand feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway end used only by piston-type aircraft. The northeast end of an unimproved dirt landing strip on Danish Bench is 5,000 feet southeast from the currently operating cell of the landfill. The following is known about the dirt strip:
>
> > (1) The dirt landing strip is not listed by the FAA as either a public or a private airport; and
> >
> > (2) The dirt strip is not shown on current editions of the Las Vegas and Denver Sectional Aeronautical Charts published by the Federal Aviation Agency.

In Tahoma's opinion the dirt ~~strip~~ landing strip has been abandoned.

o O o

Thanks again for the prompt advice from your agency. Tahoma Companies will soon be involved in license applications for several other Utah landfills. It is nice to know where we can get help on aviation issues so readily.

Sincerely,

Gary Farnsworth Player
Principal Geologist
Registered California Geologist No. 4984
File:TT8A\license\faalet

SEISMIC STUDY

EMERY COUNTY
CLASS I LANDFILL SITE

Prepared for

Emery County Board of Commissioners
Post Office Box 629
Castle Dale, Utah 84513
Contact: Bevan Wilson

Dated

May 21, 1996

Prepared by

TAHOMA COMPANIES, INCORPORATED ❖ WBE
444 South Main Street, Suite C-7
Cedar City, Utah 84720
(801) 865-0131 ☎ fax 865-0161

TABLE OF CONTENTS

APPENDICES

SEISMIC IMPACT ZONE

A seismic impact zone is defined as a location where the expected peak acceleration from seismic activity is greater then 0.1 times the acceleration due to gravity (g). The site for the Emery County Landfill is in an area where the predicted Maximum Horizontal Acceleration (MHA) would exceed 0.1g, placing it in a seismic impact zone.

SEISMIC IMPACT ZONE ANALYSIS

INTRODUCTION

To be compliant with RCRA Subtitle D (258) *Seismic Design Guidance for Municipal Solid Waste Landfill Facilities,* analysis of seismic response and dynamic deformation must be conducted for any landfill within a seismic impact zone. The Emery County landfill may experience peak accelerations of 0.1 to 0.3g. Therefore, these analyses have been prepared.

The Landfill has been designed with two types of slopes. Phases 1 through 4 have refuse slopes lying on top of and independent of underlying shales and gravels. These slopes are designed at 4:1 (horizontal to vertical). Phases 5 through 7 are contained in an excavated depression, so the integrity of the slope depends on the wall gradient, which will be at 3:1. Phases 8 and 9 have the same configuration as Phases 1 through 4. Therefore, the analyses for one slope may be representative of like phases. The factors of safety for these slopes were found to be greater than 1.0g and the modeled deformations incurred by seismic activity were acceptable.

METHODOLOGY

A slope stability analysis is used to determine the location of the potential failure surfaces and the corresponding factors of safety. This slice is used in the earthquake modeling program to determine the response of the site to seismic motion. The design accelerations are then used to calculate the peak acceleration, the yield acceleration, and deformation of the proposed slope configuration due to the activity of the model earthquake. Two failure surfaces were considered for this study: the unconfined refuse slopes of 4:1, and shale slopes confining the refuse at 3:1.

An acceptable movement along the shale surface would be one-half to one foot according to the guidelines set forth by the U.S. Environmental Protection Agency and Utah Department of

Environmental Quality. Acceptable deformations for refuse alone have not been defined. Due to the nature of the material, regrading the refuse after a seismic event would be relatively easy and inexpensive if movement was minimal.

ANALYSIS

Design Earthquakes

The design earthquake used for the analysis was chosen to have an MHA of at least 0.3g, as depicted on a seismic hazard map with a 90% or greater probability that the acceleration will not be exceeded in 250 years. An earthquake event with a probable occurrence of 490 years and a magnitude of 7.0 was chosen for the model. As this event is greater in magnitude than the required model event, a more conservative estimate with a greater final deformation on the failure surfaces was obtained. The design earthquake acceleration history was derived from a published earthquake motion record (see Appendix A). The duration of shaking for this event was not restricted, though historically, the time expected will not exceed 20 seconds.

The Emery County Landfill is located 14 miles east of the Joe's Valley fault, the closest potential location of seismic activity to the landfill site. A 7.0 magnitude earthquake model was a reasonable event to use for this analysis.

Slope Stability and Deformation Analysis

Static and pseudo static analysis were done for the two slope types in the Emery County Landfill. The Bishop method of slices was used for these calculations. A factor of safety for the slope as a whole and for each slice was calculated and the profile for the least stable slice was used for the dimensions for the soil profile input into the seismic response program. The yield accelerations for the soil and refuse cross sections were calculated according to methods outlined by N. Matasovic.

The failure surface was used as soil layer input for WESHAKE. Peak accelerations were found using this modeling program for soil profiles both with and without the refuse layer. Plan views and cross section views of the slope profiles for the two types of landfill unit designs are shown in Attachment 13 of the *Emery County Landfill Revised Application for a Permit to Operate a Class I Landfill*, Sheets 6 and 7.

Dynamic Materials Properties

To represent the properties of refuse materials it is a common practice to use average values of peat and clay for the shear modulus and damping ratio required to analyze the accelerations caused by the model earthquake. Appendix B shows the curves for these values. The properties for the soil were taken from known values for Mancos Shale deposits. Please see Table 1 for these values.

TABLE 1: SUMMARY OF MATERIAL PROPERTIES

STATIC STABILITY		
Property	**Shale**	**Refuse**
Unit Weight (pounds per cu ft)	147.5	50.73
Cohesion (c', pounds per sq ft)	3,446	100
Angle of Internal Friction (ϕ', degrees)	22	20
Static Factor	9.67	2.92
DYNAMIC STABILITY		
Property	**Soil**	**Refuse**
Yield Acceleration (required to produce a factor of safety = 1.0, (g)	0.85	0.09
Acceleration at Failure Surface (g)	0.29	0.23
Deformation (feet)	0.92	5.60

RESULTS

WESHAKE analysis indicates that the accelerations are maximum at the gravel layer of the soil profile, 0.293g, and are minimum at the top soil layer, the refuse, 0.226g (see Table 2). Absolute peak accelerations are shown in the Acceleration vs. Time graph provided as Appendix C. The critical acceleration is calculated in a separate analytical procedure. This is the acceleration at which the slope will yield. The values for absolute and yield accelerations are used to determine the projected deformation values. The time interval during which the modeled absolute acceleration

is greater than the yield acceleration is used as the limits for integration to attain the velocity spectrum. These values are then integrated to find the maximum deformation of the slope.

TABLE 2: SOIL/ACCELERATION PROFILE

Layer	Depth (feet)	Acceleration (g)
1	0.0	0.226
2	37.5	0.293
3	42.5	0.286
4	370.0	0.282

The analysis shows that the proposed soil slopes have the potential to deform slightly. The expected movement along the failure surface is less than one foot and, therefore, within acceptable limits. The deformation of the refuse layer has the potential for a much higher rate of strain, up to 5.6 feet in movement. This should not affect the integrity of the landfill as a whole, as the refuse layer will not affect other structures or surfaces of the site. Phases 5 through 7 are designed so that the refuse is contained in a pit excavated into shale and gravel. Therefore, any motion is dependent on the integrity of the shale and will be minimal. The failure potential for the underlying structures is very low.

CONCLUSIONS

In static conditions, the design of the landfill is very stable. To anticipate likely movement due to seismic activity of the refuse and shale layers, a model was used that would represent an event of major proportions. The annual probability of a 7.0 earthquake occurring in this area is 4.9×10^{-4}. The results indicate that even with induced stresses of this magnitude, the resulting strain is well within tolerable limits. We can therefore conclude that seismic hazard is not a major concern for this landfill site.

K:\CLIENTS\93683-3\REPORTS\SEISMIC RPT

REFERENCES

Algermissen, S T., D.M Perkins, P C. Thenhaus, S.L. Hanson and B.L. Bender, 1990, Probabilistic Earthquake Acceleration and Velocity Maps for the United States and Puerto Rico: U.S Geol. Survey Map MF 2120.

Arabasz, et al. 1988. "Observational Seismology and the evaluation of Earthquake Hazards and Risk in the Wasatch Front Area, Utah" U. S. Geological Survey, June 1988.

ASTM (American Society of Testing and Materials).1995 "Annual Book of ASTM Standards". American Society for Testing and Materials, Philadelphia.

Goodman, Richard E. 1989 "Introduction to Rock Mechanics" University of California at Berkeley, John Wiley and Sons, New York, 1989.

Matasovic, Nevin "Selection of Method for Seismic Slope Stability Analysis" University of Missouri, Rulkla, Missouri, 1991.

Seed and Idriss. 1970 "Soil Moduli and Damping Factors for Dynamic Response Analyses" Earthquake Engineering Research Center, Report No. EERC 70-10, University of California, Berkeley, December 1995.

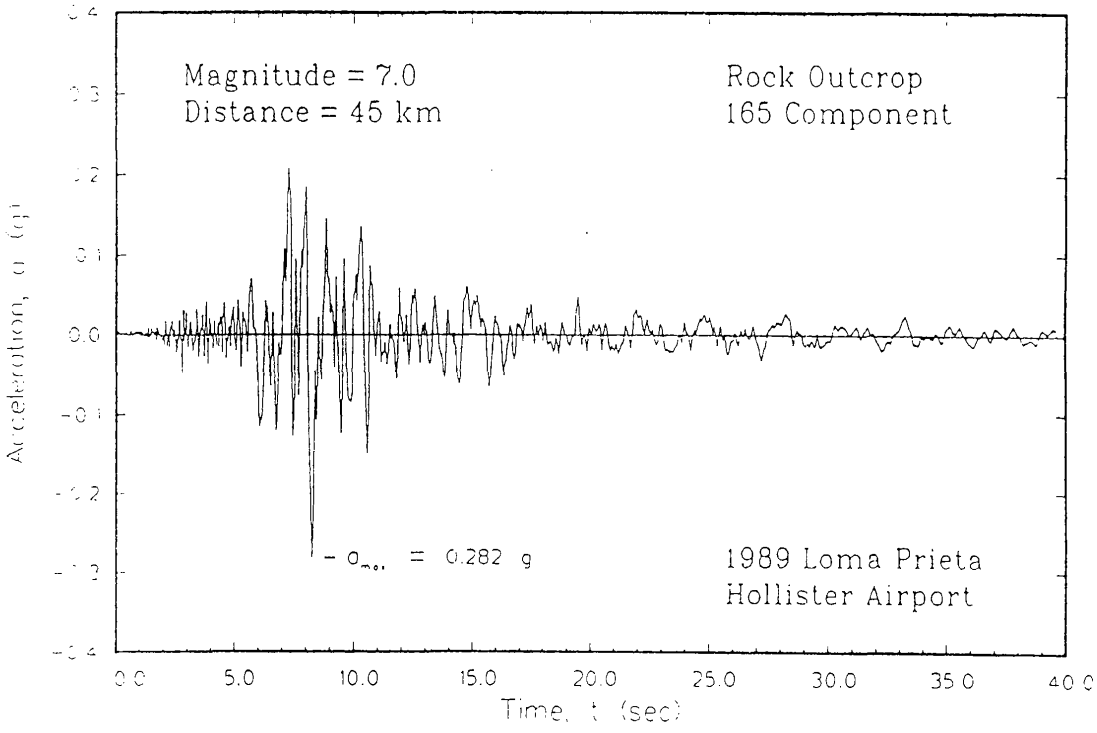
Seed and Bonaparte. 1992 "Seismic Analysis and Design of Lined Waste Fills: Current Practice" University of California, Berkeley, 1993.

Sykora and Wahl "WESHAKE USACE Geotechnical Earthquake Engineering Software" Program based on the original SHAKE published December 1972 by Schnabel, Lysmer and Seed, Izzat M. Idriss and J. Sun, Center for Geotechnical Modeling, Department of Civil and Environmental Engineering, University of California, Davis, California, November.

U.S. EPA 1994 Final Draft RCRA Subtitle D (258) Seismic Design Guidance for Municipal Waste Landfill Facilities.

APPENDIX A

EARTHQUAKE EVENT RECORD

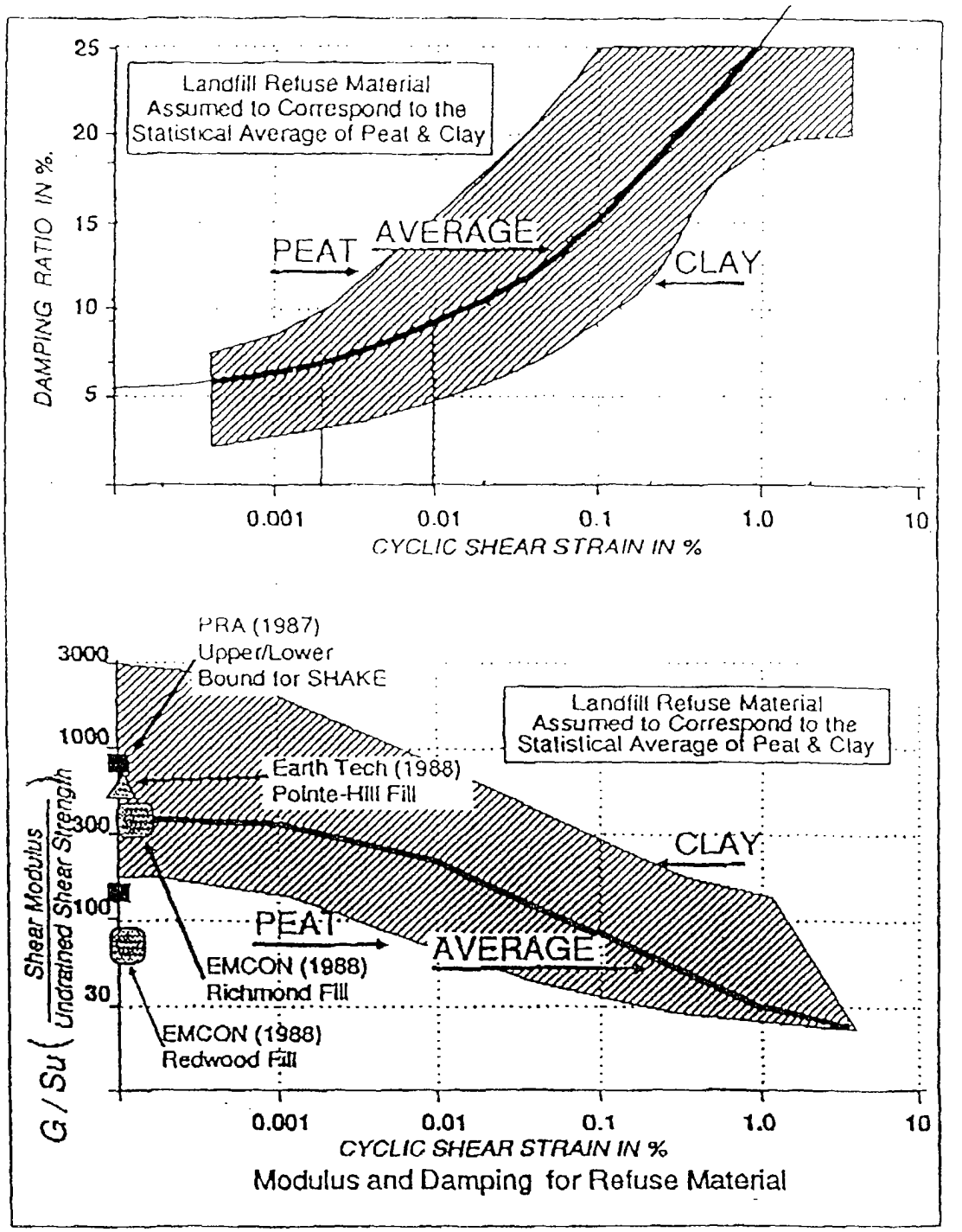


Hollister Airport record of 1989 Loma Prieta, California, earthquake

APPENDIX B

DYNAMIC PROPERTIES FOR REFUSE

Dynamic Properties for Refuse (Singh and Murphy, 1990)



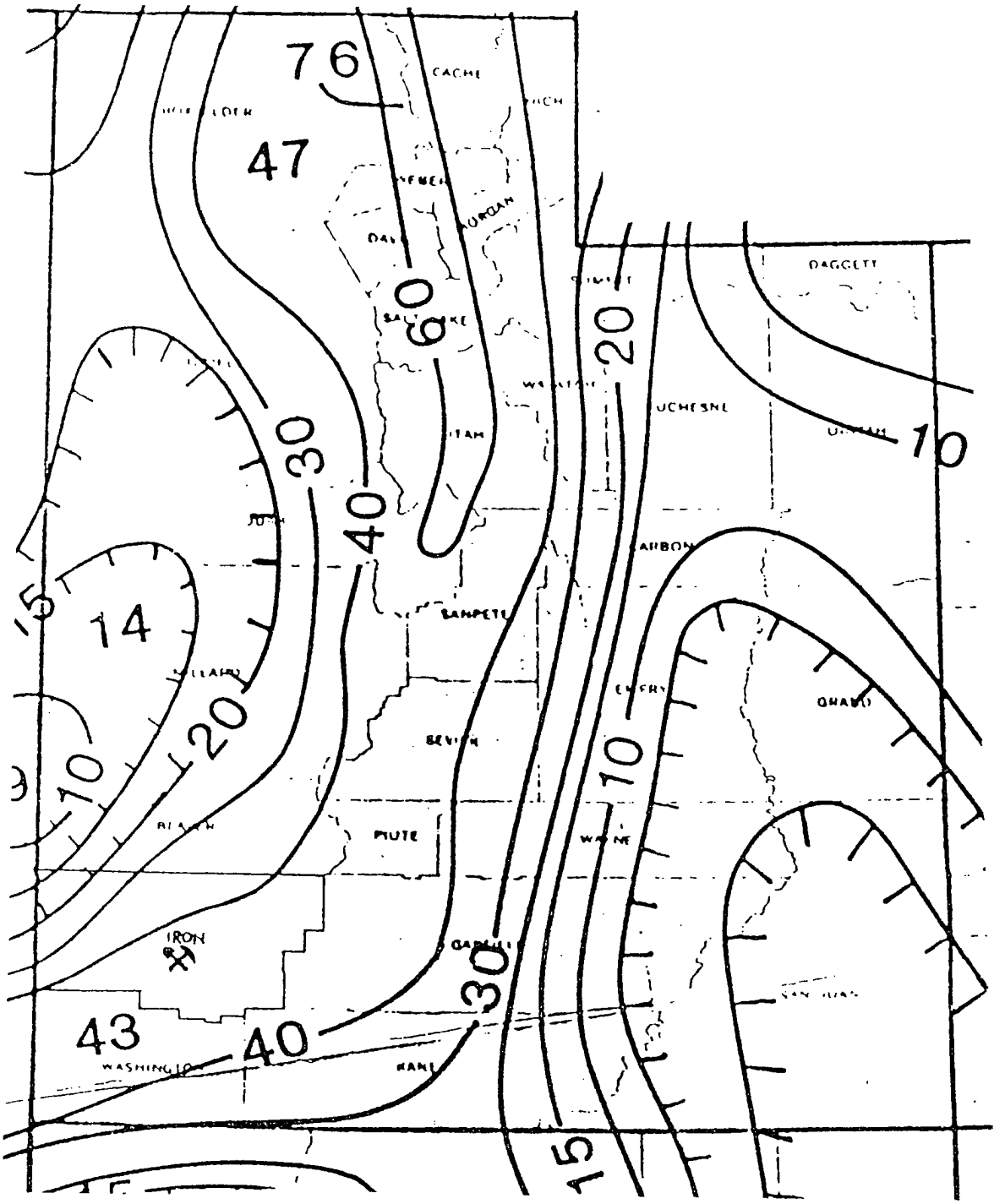
Modulus and Damping for Refuse Material

Note: Data Points are estimated average values from shear wave data for Su=143 KN/m^2

APPENDIX C

ACCELERATION VS. TIME CURVE

MAP OF HORIZONTAL ACCELERATION, A
(expressed as percent of gravity)
ATTACHMENT #18



Map of Probable Horizontal Acceleration in Rock
From: U.S. Geological Survey (1988)

Tahoma Companies, Incorporated
444 South Main, Suite C-7
Cedar City, Utah 84720
Phone: (435)865-0131 Fax: (435)865-0161

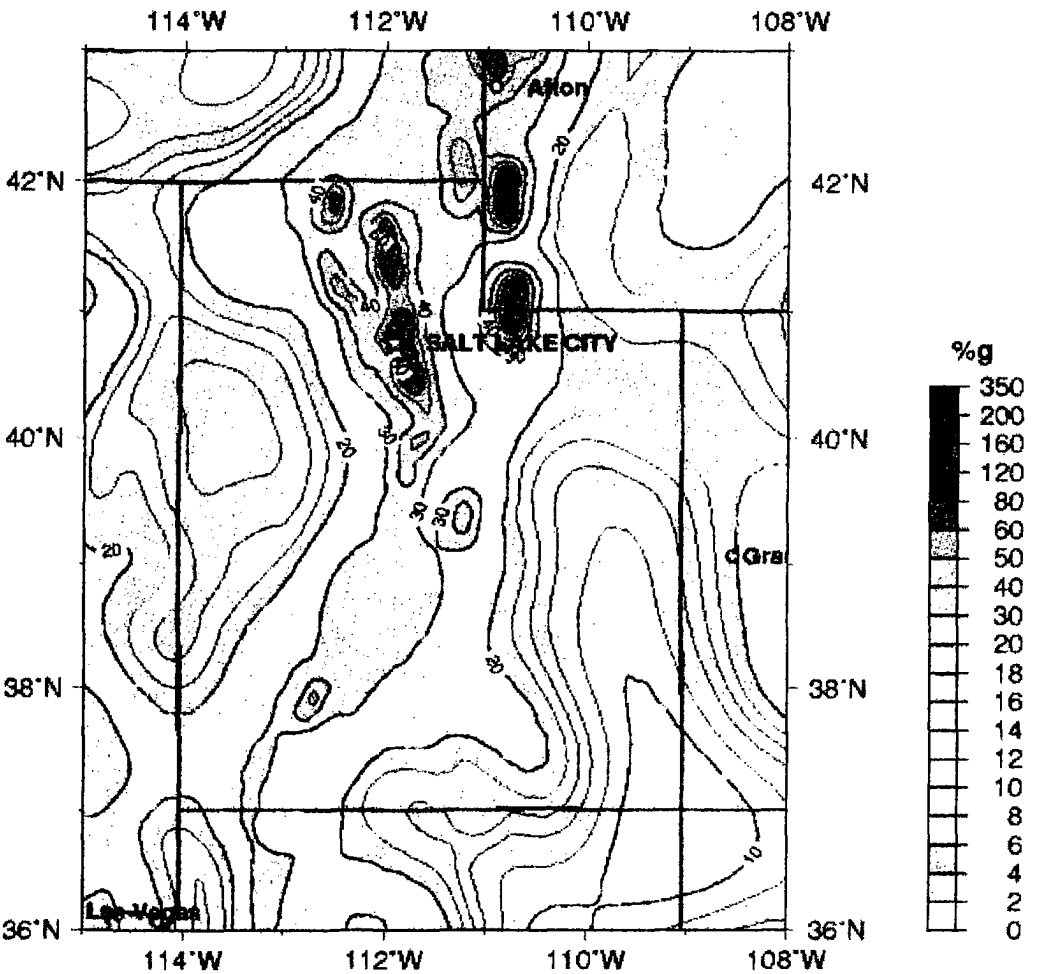
Date: December 16, 1997	**Nielson Construction Landfill**
ACCEL TCW	**Castle Dale, Utah**
Scale:	
Drawn by: G. Hatch	
Tahoma Job No: 97018	

USGS
science for a changing world

Earthquake Hazards Program

Utah

Seismic Hazard Map



Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years
site: NEHRP B-C boundary
National Seismic Hazard Mapping Project

USGS National Seismic Hazard Maps

U.S. Department of the Interior | U.S. Geological Survey
URL: http://earthquake.usgs.gov/regional/states/utah/hazards.php
Page Contact Information: EHP Web Team
Page Last Modified: February 11, 2008 18:07:04 UTC
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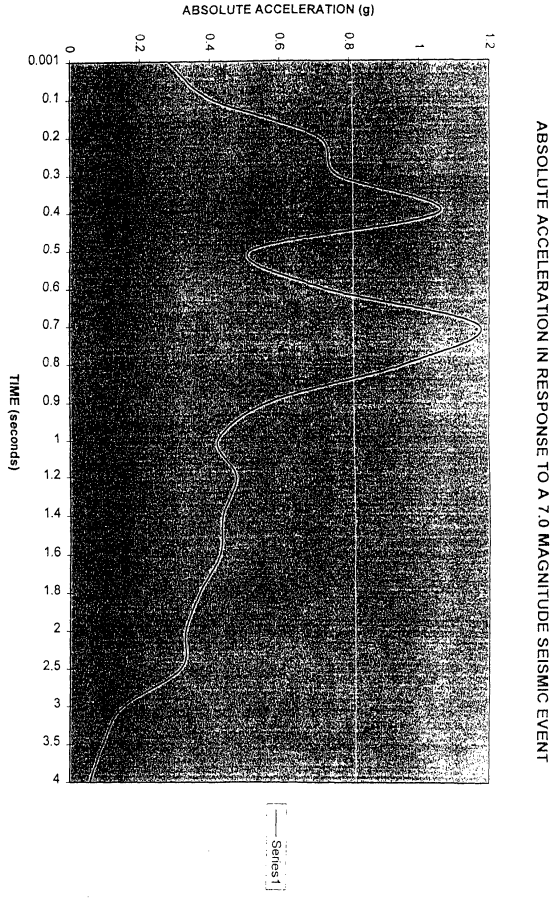


ABSOLUTE ACCELERATION IN RESPONSE TO A 7.0 MAGNITUDE SEISMIC EVENT

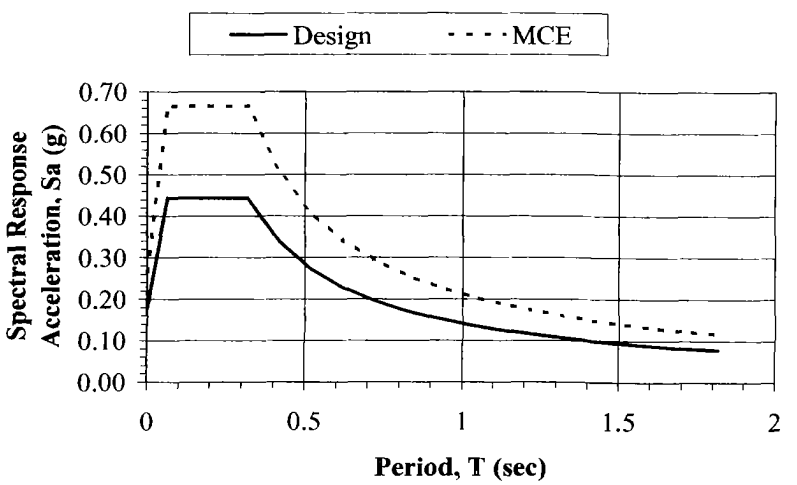
TAHOHA COMPANIES INC.	NTS	J. BENNETT MAY 1996

EMERY COUNTY LANDFILL
EARTHQUAKE EVENT RECORD

SITE GROUND MOTION [IBC SECTION 1615]

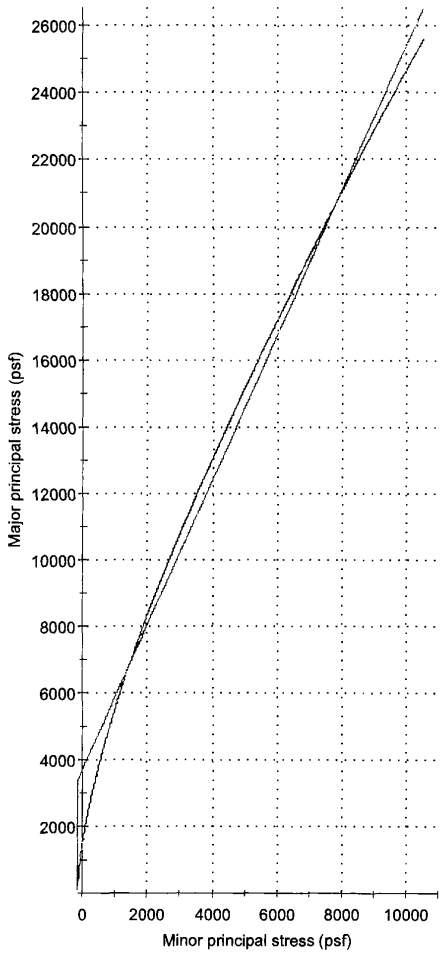
Project:	**Nielson Construction**	***Number:***	**01103-001**
Latitude =	**39.2576**	**Date:**	**4/7/08**
Logitude =	**-111.024**	**By:**	**DS**

S_S =	0.666 (g)	The mapped spectral accleration for short periods	[1615.1]
S_1 =	0.212 (g)	The mapped spectral accleration for a 1-second period	
Site Class =	B	Table 16.15.1.1	
Fa =	1.00	Table 1615.1.2(1)	
Fv =	1.00	Table 1615.1.2(2)	
S_{MS} =	0.666	S_{MS} = Fa*Ss	*The maximum considered E.Q. spectral resonse accelerations
S_{M1} =	0.212	S_{M1} = Fv*S_1	for short and 1-second periods [1615.1.2]
MCE/PGA =	**0.266**	**0.4*S_{MS} [Equation 16-42 in accordance with 1802.2.7 and 1615.2.1]**	
S_{DS} =	0.444	S_{DS} = 2/3*S_{MS}	*The design spectral response acceleration
S_{D1} =	0.141	S_{D1} = 2/3*S_{M1}	at short and 1-second periods
T_0 =	0.064	T_0 = 0.2*S_{D1}/S_{DS}	
T_s =	0.318	T_s = S_{D1}/S_{DS}	
ΔT =	0.1	Time step for diagram	



T (sec)	Sa (g)	Sa (MCE) (g)
0	0.18	0.27
0.06	0.44	0.67
0.32	0.44	0.67
0.42	0.34	0.51
0.52	0.27	0.41
0.62	0.23	0.34
0.72	0.20	0.30
0.82	0.17	0.26
0.92	0.15	0.23
1.02	0.14	0.21
1.12	0.13	0.19
1.22	0.12	0.17
1.32	0.11	0.16
1.42	0.10	0.15
1.52	0.09	0.14
1.62	0.09	0.13
1.72	0.08	0.12
1.82	0.08	0.12

Nielson Construction Landfill 01103-001 Shale Strength Analysis

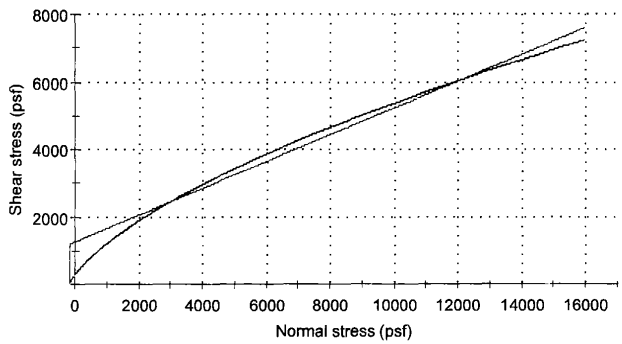


Hoek-Brown Classification
intact uniaxial comp. strength (sigci) = 730000 psf
GSI = 21 mi = 4 Disturbance factor = 0.7
intact modulus (Ei) = 1.46e8 psf
modulus ratio (MR) = 200

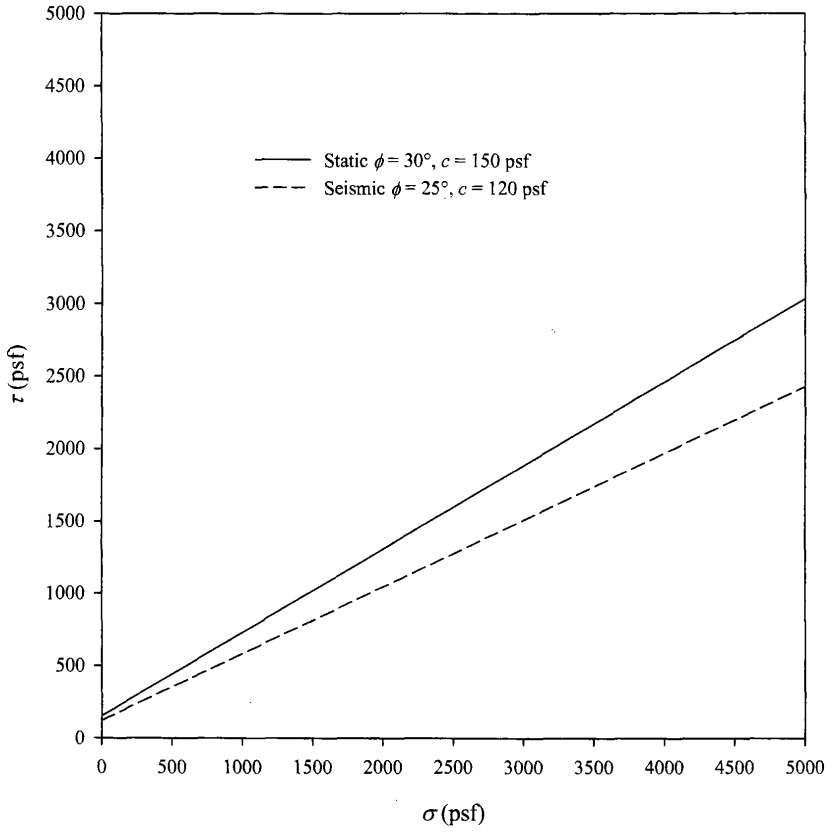
Hoek-Brown Criterion
mb = 0.052 s = 1.07e-5 a = 0.541

Mohr-Coulomb Fit
cohesion = 1258.450 psf friction angle = 21.60 deg

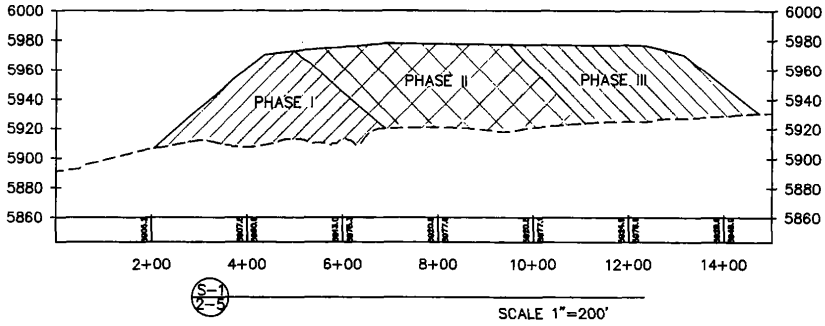
Rock Mass Parameters
tensile strength = -149.290 psf
uniaxial compressive strength = 1492.236 psf
global strength = 16418.014 psf
modulus of deformation = 3962660.86 psf



MSW Strength Envelopes



Static and seismic Mohr-Coulomb strength envelopes. Seismic strength envelope represents a 20% reduction in shear strength.



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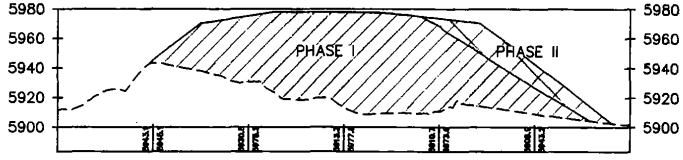

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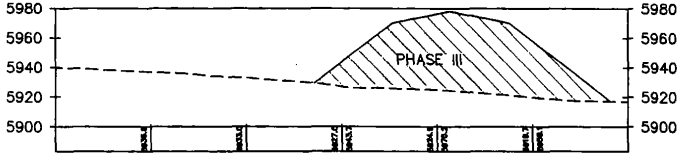


S-3 2-5

SCALE 1"=200'

0 50 100 200 300
SCALE IN FEET

NIELSON CONSTRUCTION
895 NORTH 1000 ROAD
P.O. Box 580
Huntington, UT 84528
(435) 650-2080

CONSULTANTS

IGES

NOTE: 3x VERTICAL EXAGGERATION

MARK	DATE	DESCRIPTION
	3-24-08	PERMIT
	2-27-08	DRAFT PERMIT

ISSUE:

PROJECT NO.: 01103-001

CAD DWG FILE: 01103L001_MC_LF_Grading

DRAWN BY: CLD

DESIGNED BY: CLD

CHECKED BY: RDH

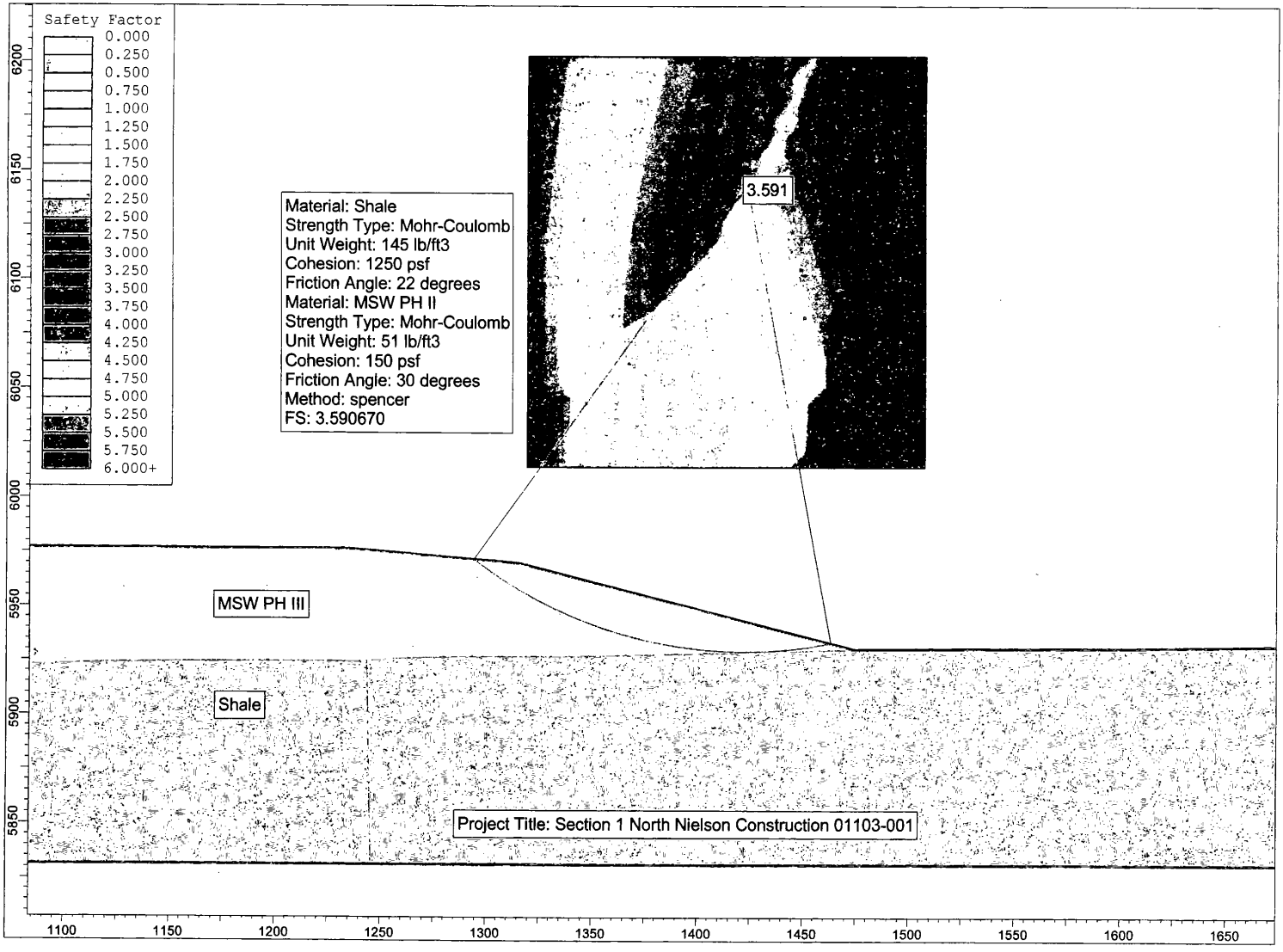
COPYRIGHT: IGES 2008

SHEET TITLE

NIELSON CONSTRUCTION LANDFILL

PROFILE VIEWS

6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3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Material: MSW PH II
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 150 psf
Friction Angle: 30 degrees
Method: spencer
FS: 3.590670
3.591
MSW PH III
Shale
Project Title: Section 1 North Nielson Construction 01103-001
6200
6150
6100
6050
6000
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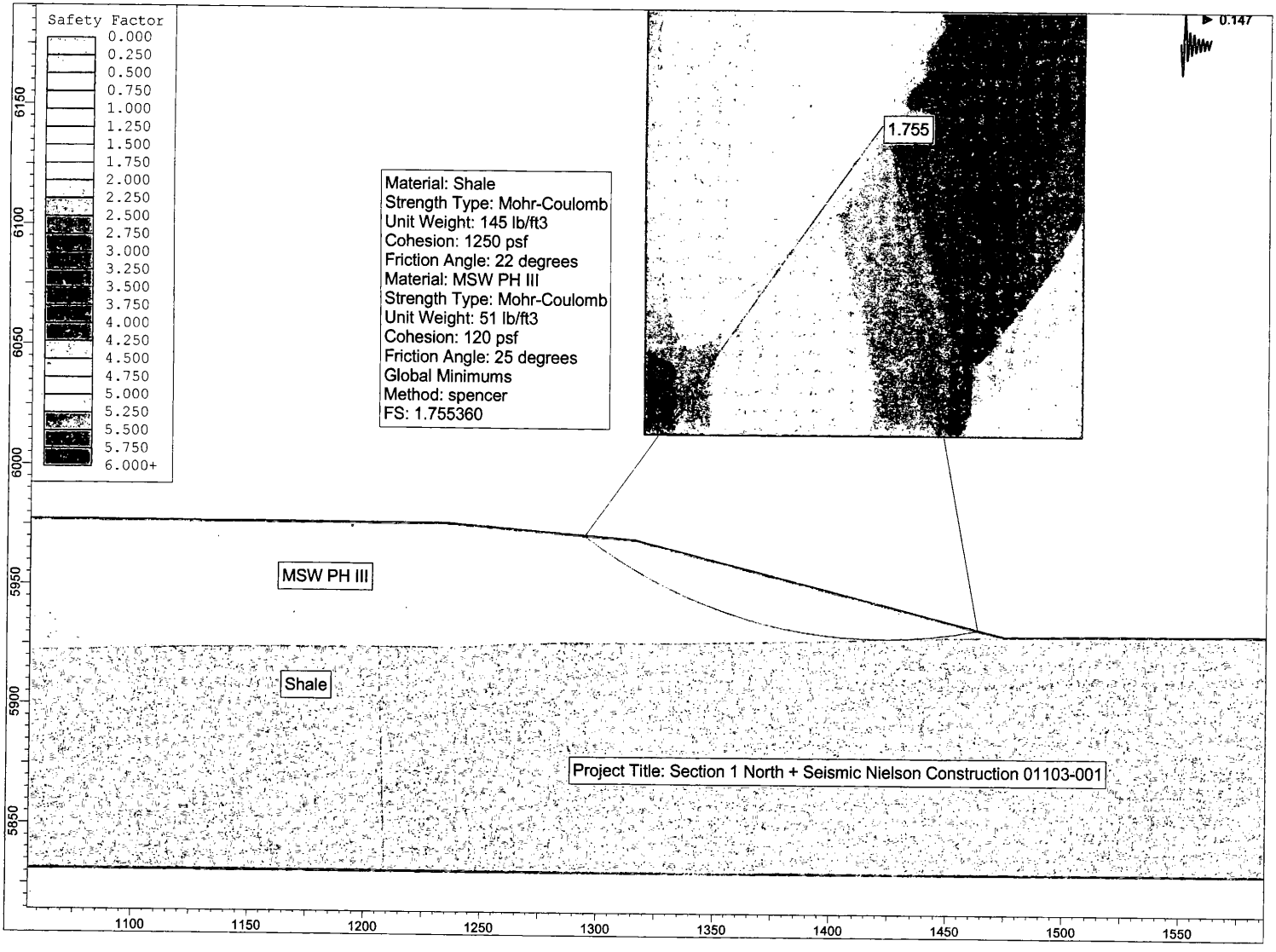
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2.250
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3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Material: MSW PH III
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 120 psf
Friction Angle: 25 degrees
Global Minimums
Method: spencer
FS: 1.755360
1.755
0.147
MSW PH III
Shale
Project Title: Section 1 North + Seismic Nielson Construction 01103-001
6150
6100
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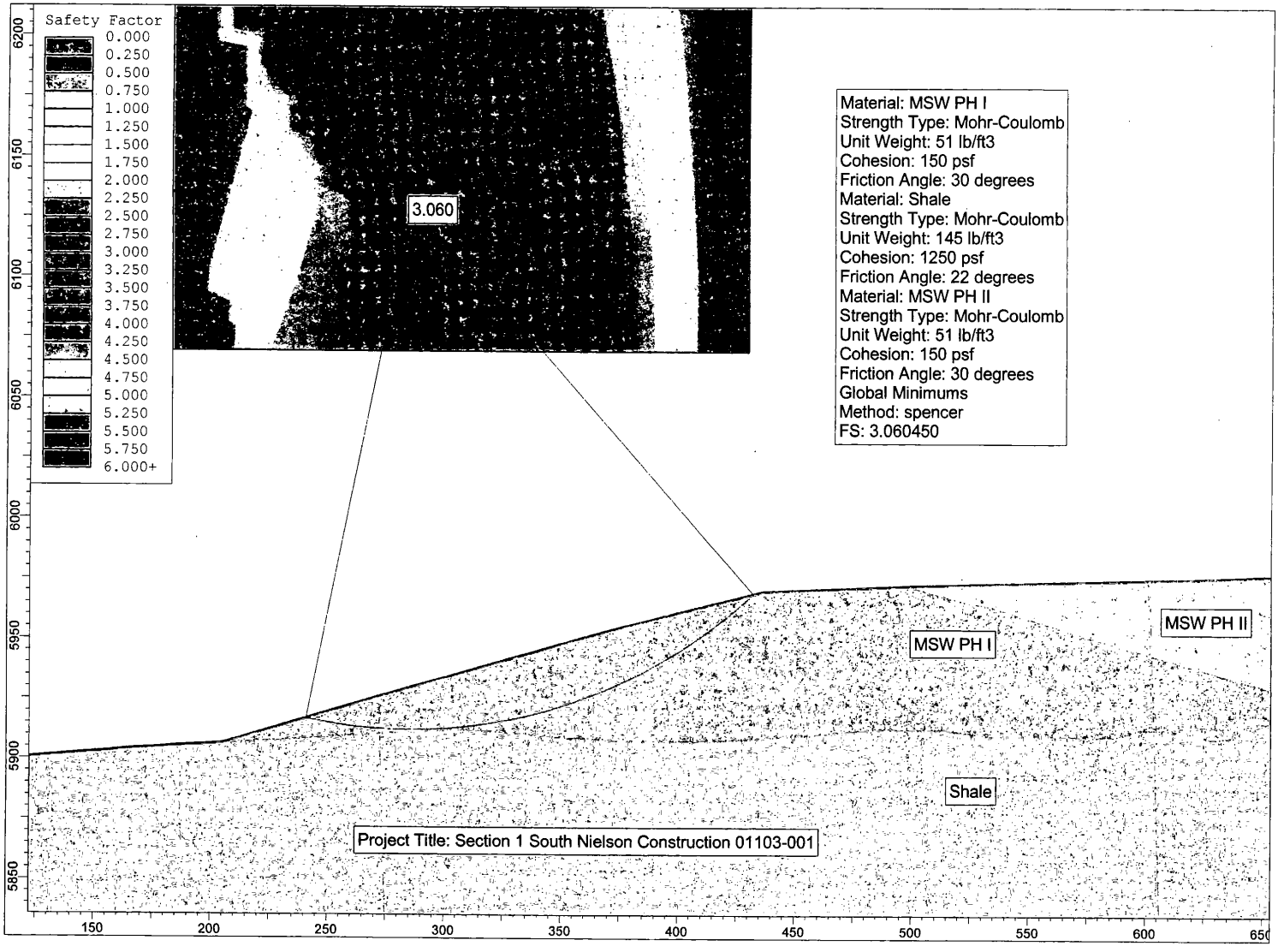
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3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
3.060
Material: MSW PH I
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 150 psf
Friction Angle: 30 degrees
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Material: MSW PH II
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 150 psf
Friction Angle: 30 degrees
Global Minimums
Method: spencer
FS: 3.060450
MSW PH II
MSW PH I
Shale
Project Title: Section 1 South Nielson Construction 01103-001
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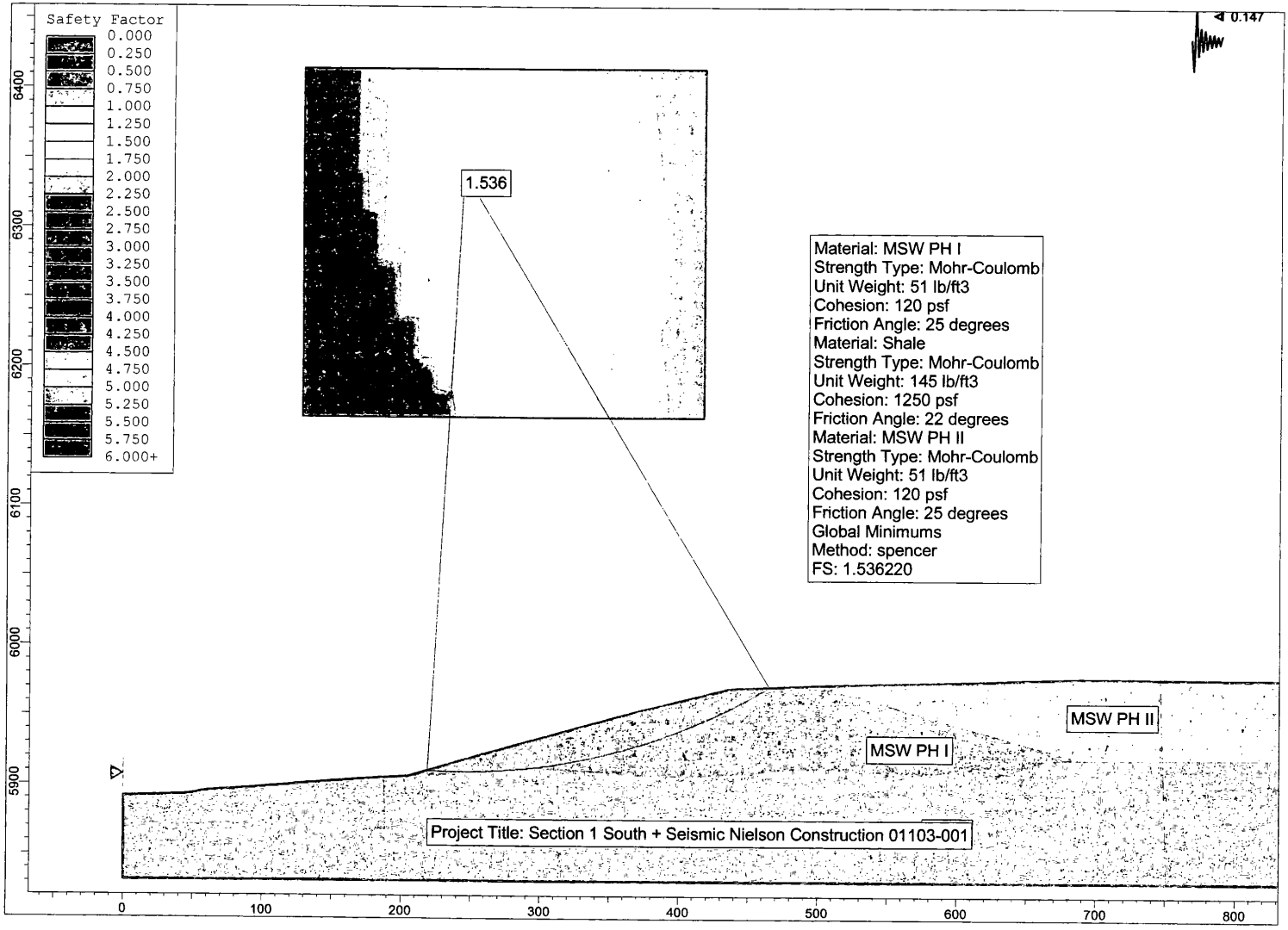
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3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.147
1.536
Material: MSW PH I
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 120 psf
Friction Angle: 25 degrees
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Material: MSW PH II
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 120 psf
Friction Angle: 25 degrees
Global Minimums
Method: spencer
FS: 1.536220
MSW PH II
MSW PH I
Project Title: Section 1 South + Seismic Nielson Construction 01103-001
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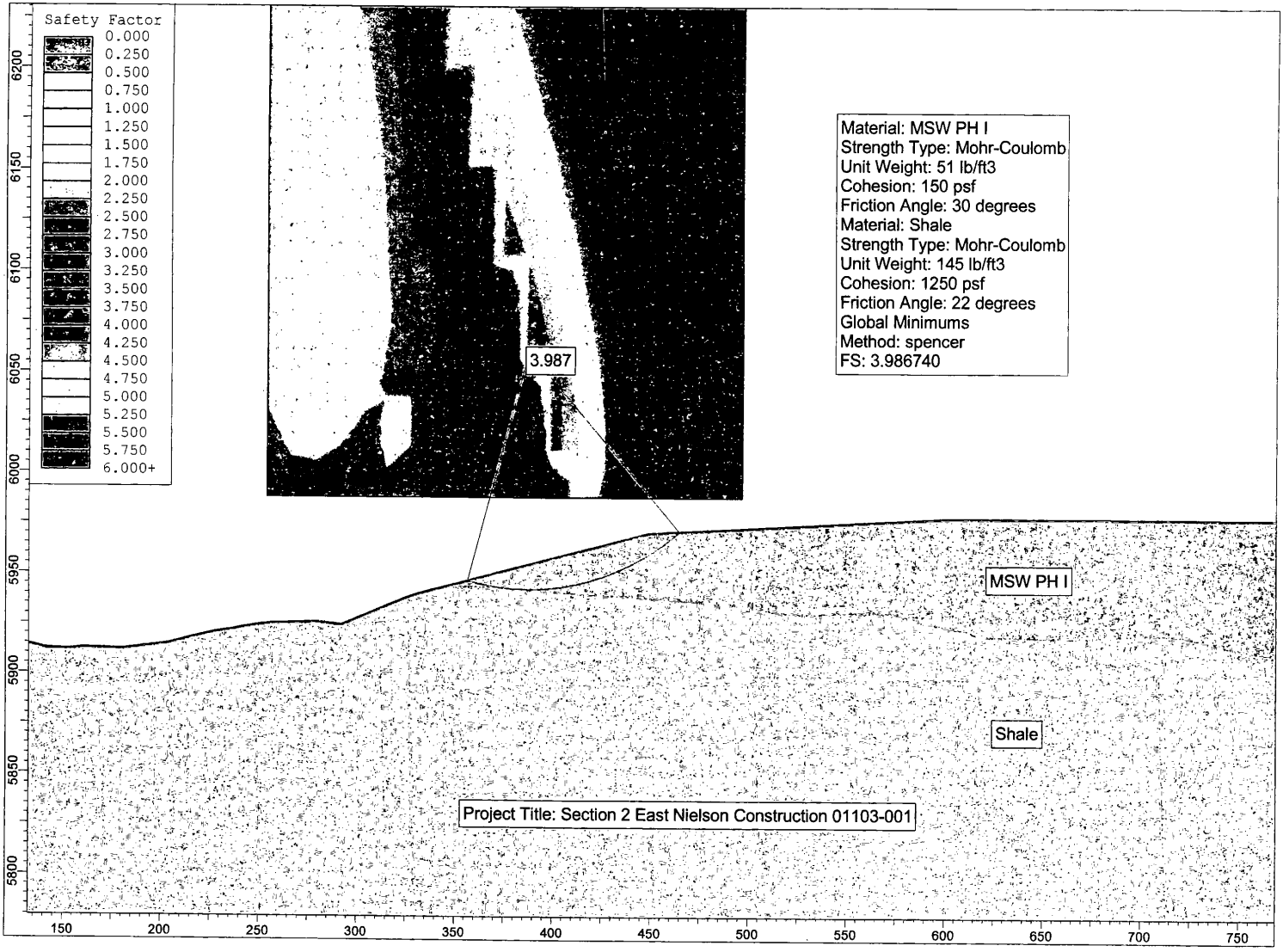
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3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
3.987
Material: MSW PH I
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 150 psf
Friction Angle: 30 degrees
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Global Minimums
Method: spencer
FS: 3.986740
MSW PH I
Shale
Project Title: Section 2 East Nielson Construction 01103-001
6200
6150
6100
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6000
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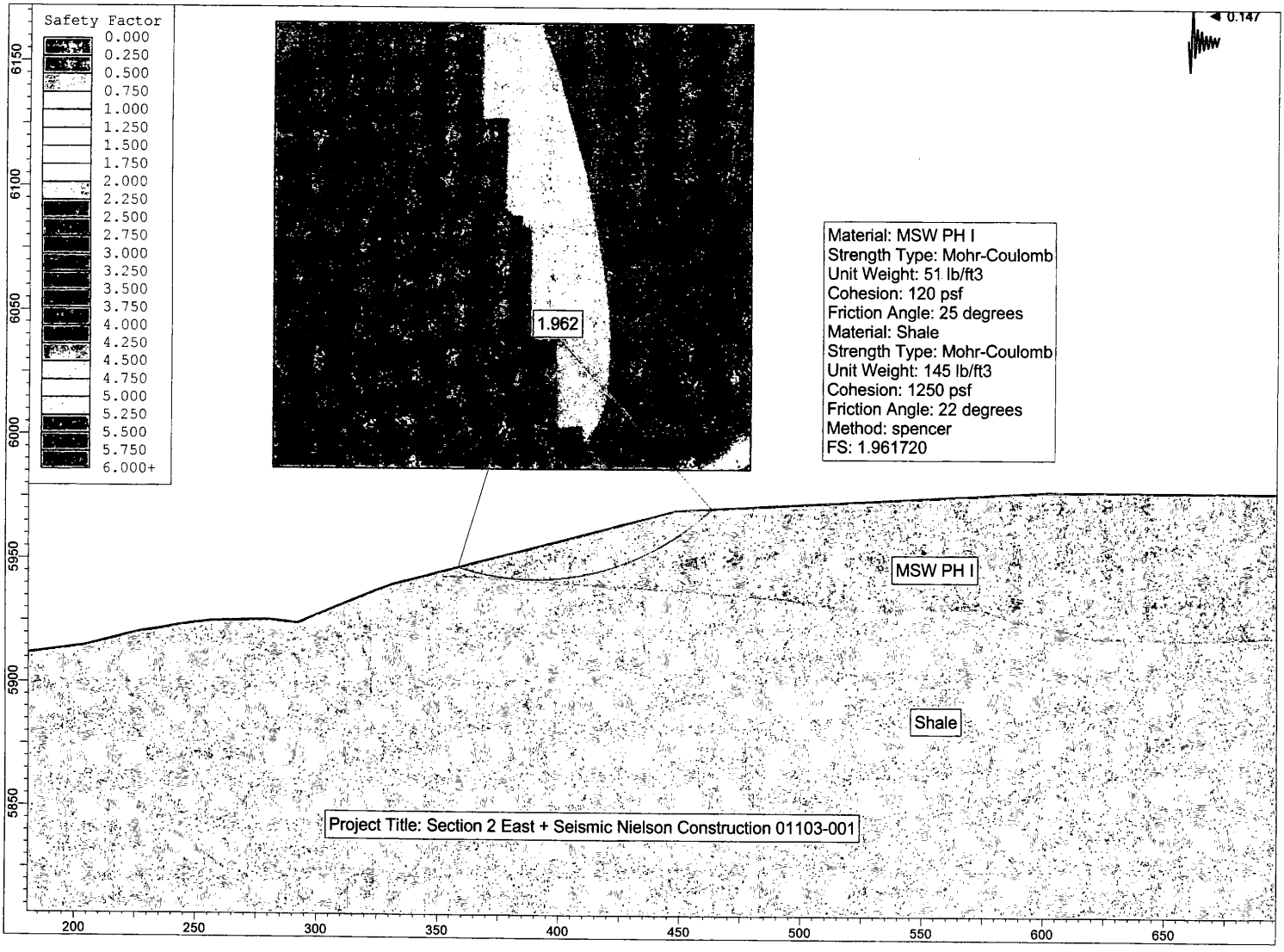
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3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
1.962
0.147
Material: MSW PH I
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 120 psf
Friction Angle: 25 degrees
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Method: spencer
FS: 1.961720
MSW PH I
Shale
Project Title: Section 2 East + Seismic Nielson Construction 01103-001
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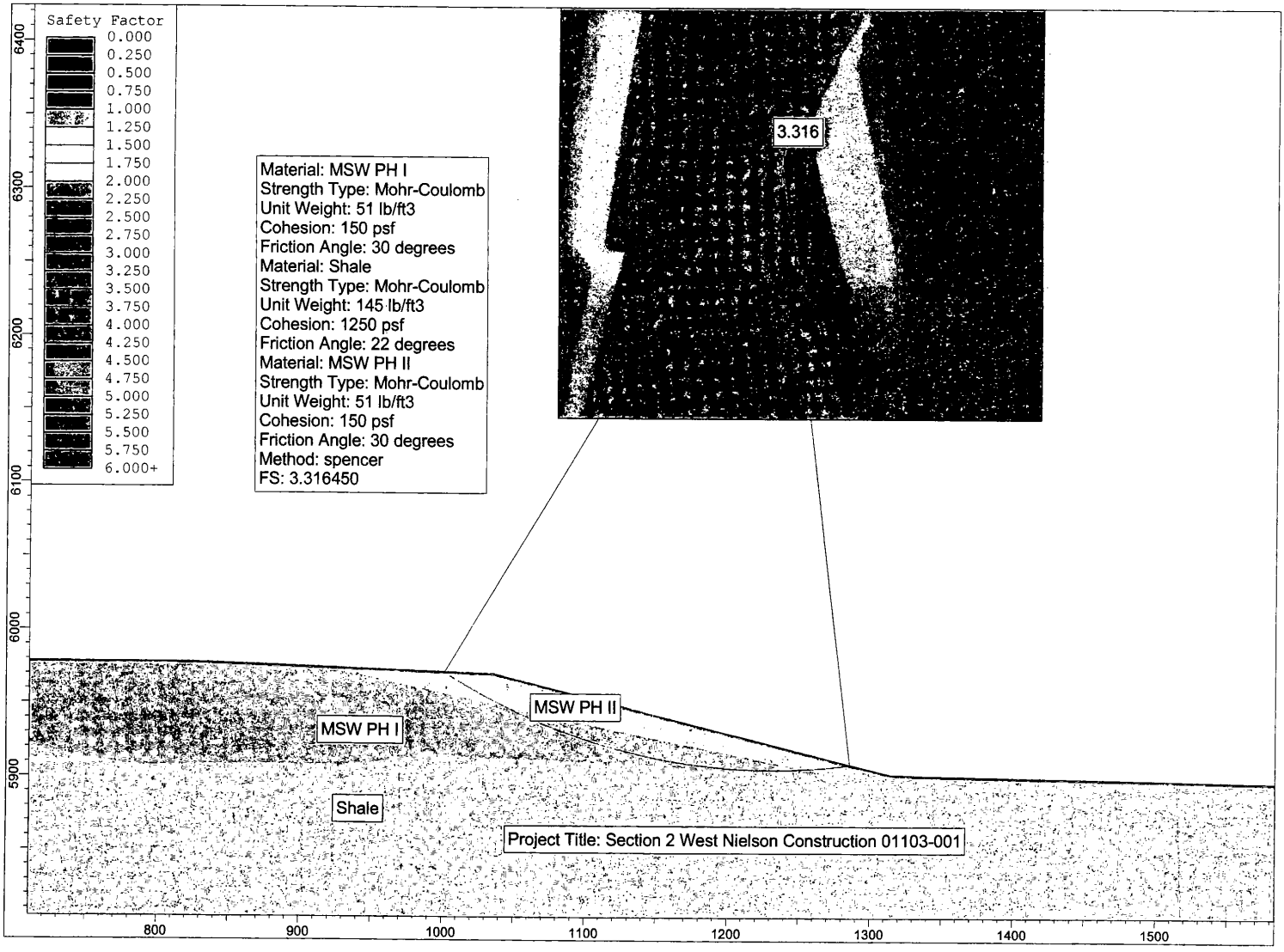
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3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Material: MSW PH I
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 150 psf
Friction Angle: 30 degrees
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Material: MSW PH II
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 150 psf
Friction Angle: 30 degrees
Method: spencer
FS: 3.316450
3.316
MSW PH II
MSW PH I
Shale
Project Title: Section 2 West Nielson Construction 01103-001
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6200
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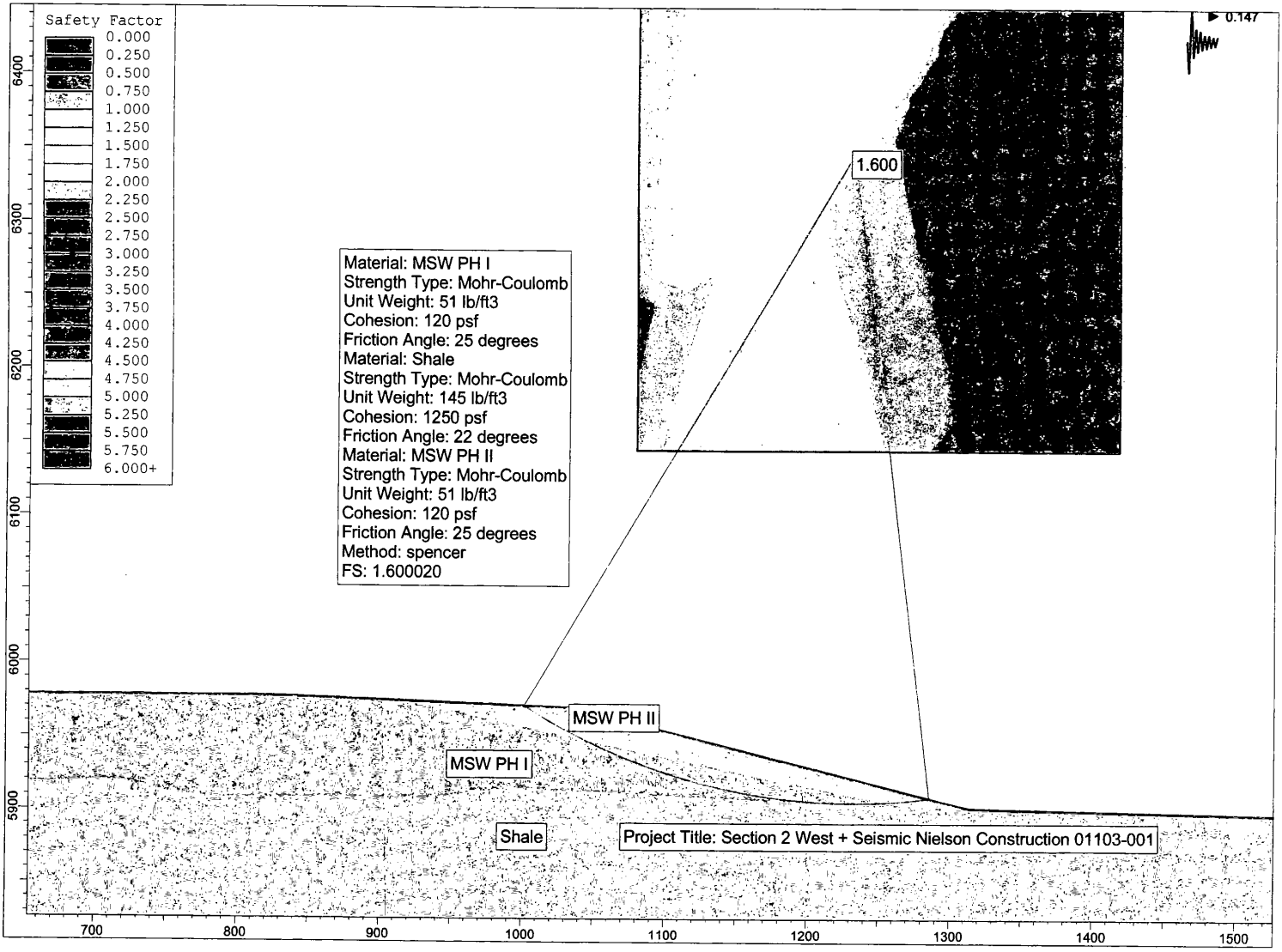
1000
1100
1200
1300
1400
1500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3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Material: MSW PH I
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 120 psf
Friction Angle: 25 degrees
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Material: MSW PH II
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 120 psf
Friction Angle: 25 degrees
Method: spencer
FS: 1.600020
1.600
0.147
MSW PH II
MSW PH I
Shale
Project Title: Section 2 West + Seismic Nielson Construction 01103-001
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6300
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5900
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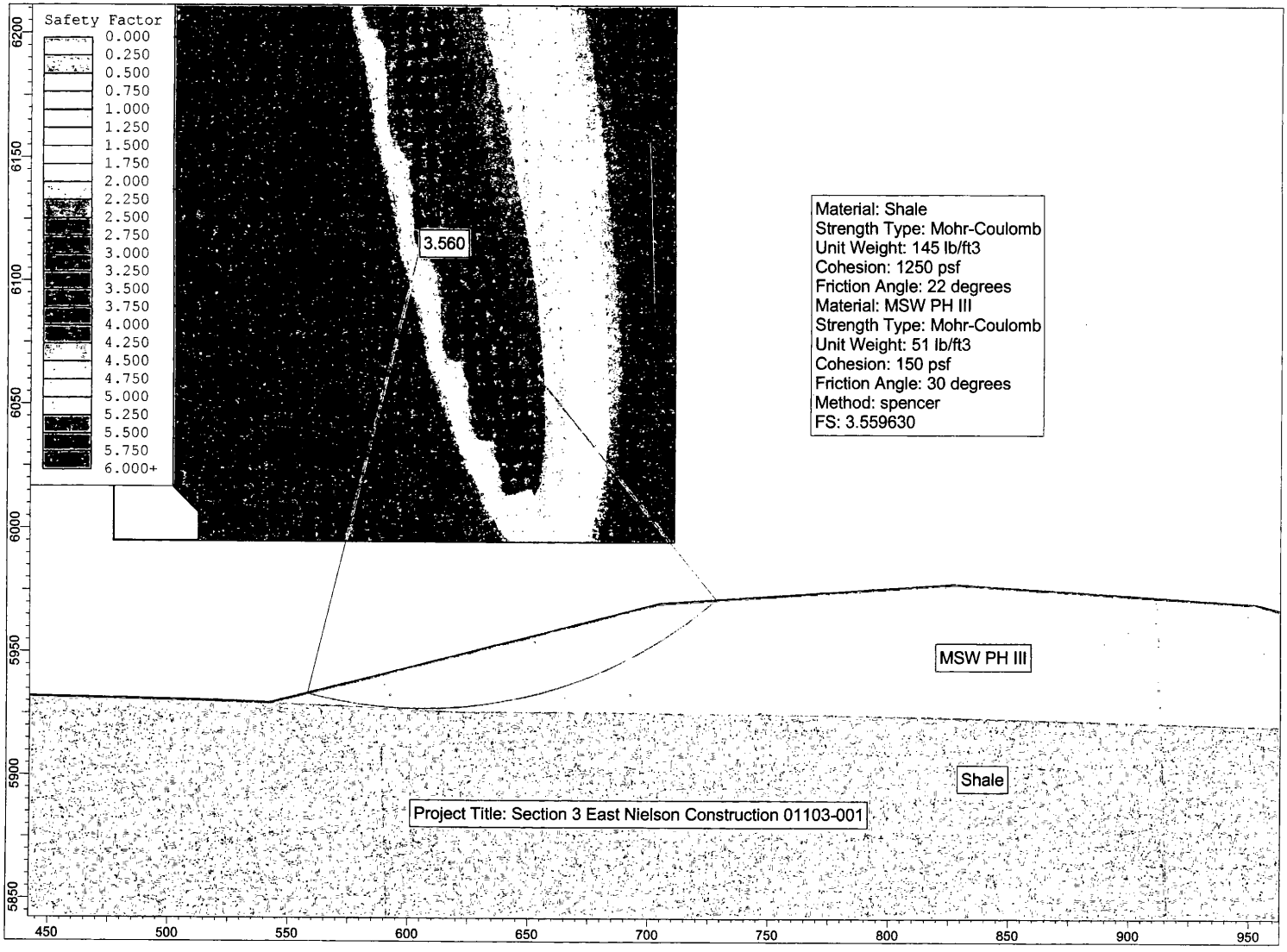
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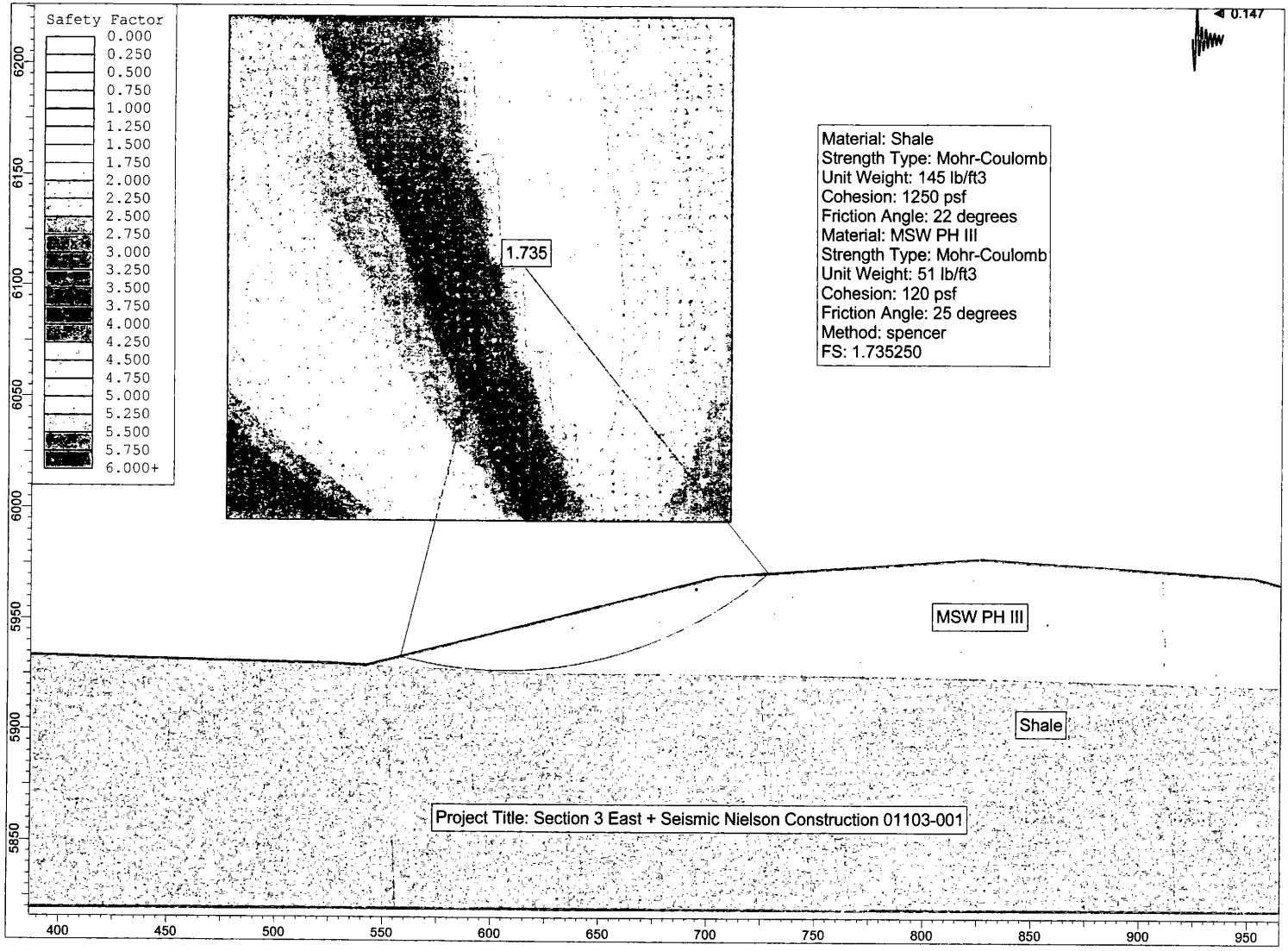
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
3.560
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Material: MSW PH III
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 150 psf
Friction Angle: 30 degrees
Method: spencer
FS: 3.559630
MSW PH III
Shale
Project Title: Section 3 East Nielson Construction 01103-001
6200
6150
6100
6050
6000
5950
5900
5850
450
500
550
600
650
700
750
800
850
900
950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3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.147
1.735
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Material: MSW PH III
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 120 psf
Friction Angle: 25 degrees
Method: spencer
FS: 1.735250
MSW PH III
Shale
Project Title: Section 3 East + Seismic Nielson Construction 01103-001
6200
6150
6100
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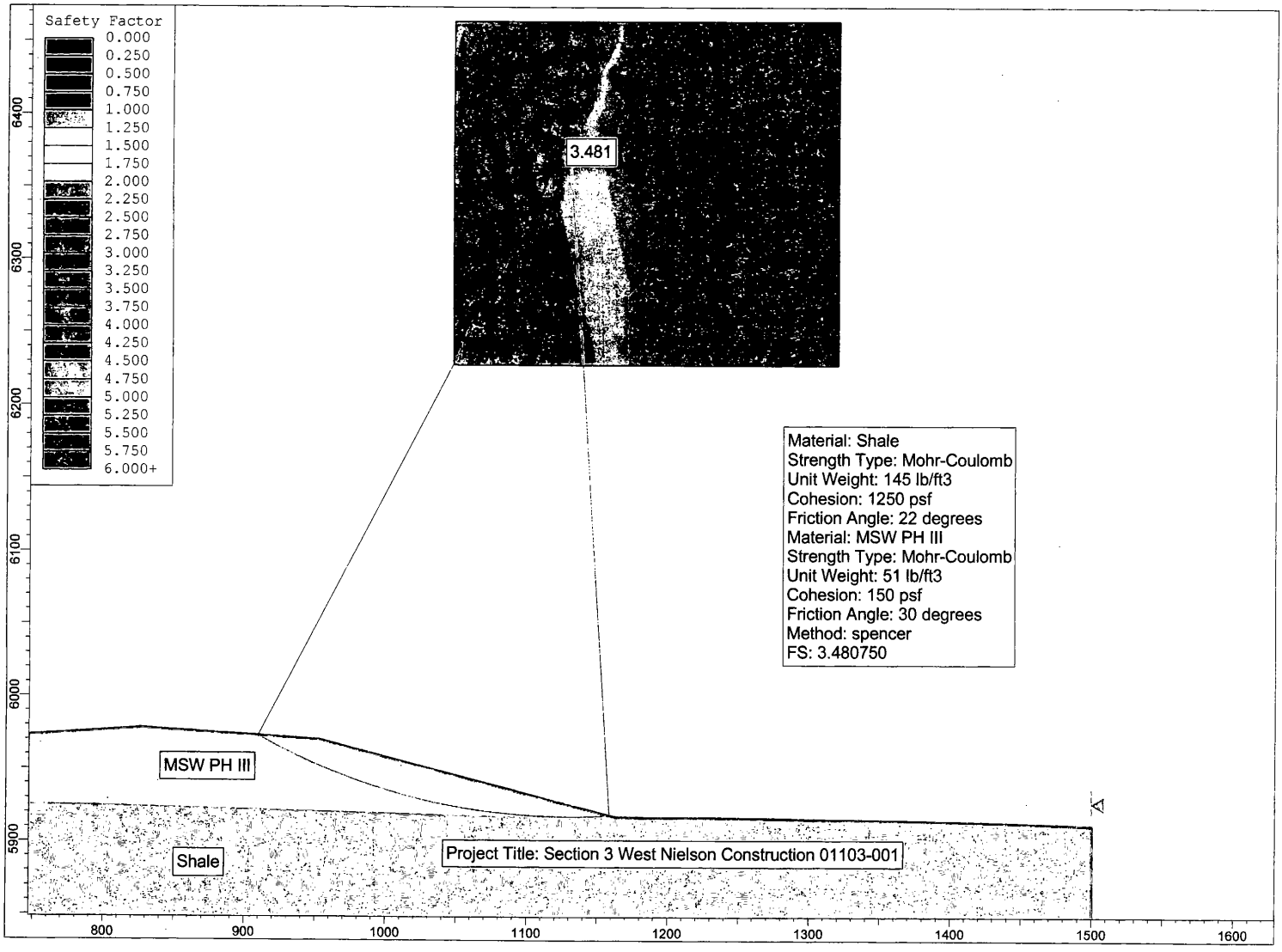
6000
5950
5900
5850
400
450
500
550
600
650
700
750
800
850
900
950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3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
3.481
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Material: MSW PH III
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 150 psf
Friction Angle: 30 degrees
Method: spencer
FS: 3.480750
MSW PH III
Shale
Project Title: Section 3 West Nielson Construction 01103-001
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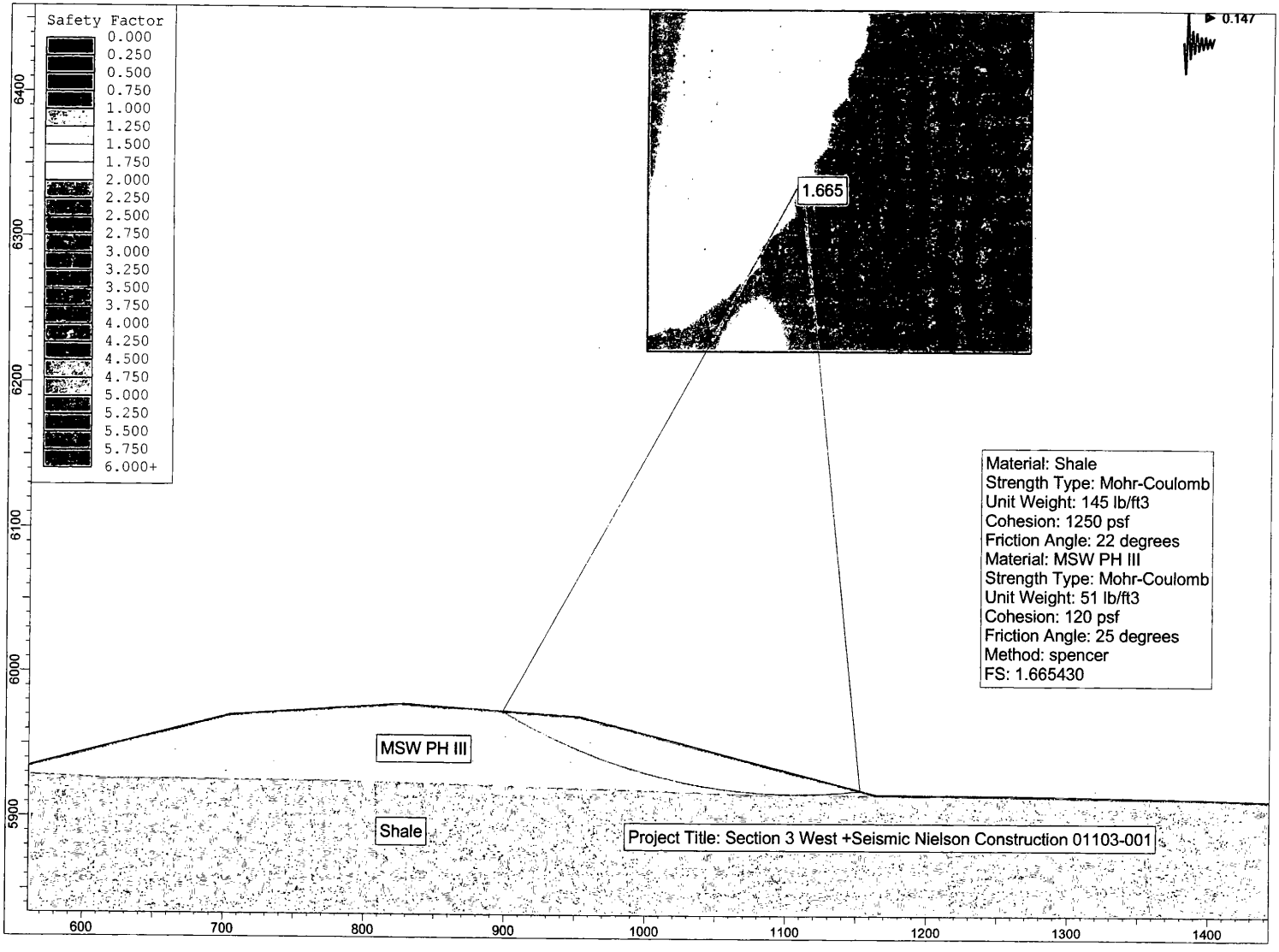
1500
1600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3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
1.665
0.147
Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 1250 psf
Friction Angle: 22 degrees
Material: MSW PH III
Strength Type: Mohr-Coulomb
Unit Weight: 51 lb/ft3
Cohesion: 120 psf
Friction Angle: 25 degrees
Method: spencer
FS: 1.665430
MSW PH III
Shale
Project Title: Section 3 West +Seismic Nielson Construction 01103-001
6400
6300
6200
6100
6000
5900
600
700
800
900
1000
1100
1200
1300
1400

Runoff Curve Number and Runoff

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/16/2008
Condition:	Existing	Comments:	Potential run-on to landfill		

1. Runoff Curve Number

Soil Name and Hydrologic Soil Group	Cover Description	CN Table 2-2	CN Table 2-3	CN Table 2-4	Area (acres)	CNxArea
C-clay loam or shallow s	sagebrush with grass understory (poor cover)	80			87.54	7003.2
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
				TOTALS: →	**87.54**	**7003.2**

CN Weighted: $\frac{\Sigma(\text{CNxArea})}{\Sigma(\text{Area})} = \frac{7003.2}{87.54} = 80$ **Use CN** → **80**

2. Runoff

		Storm #1		Storm #2		Storm #3	
		ARI (Year)	Duration	ARI (Year)	Duration	ARI (Year)	Duration
		25	24-hr				
Rainfall, P	in	1.9					
S	in	2.5					
I_a	in	0.5					
Runoff (Q)	in	0.5025641					

Technical Release 55
Urban Hydrology for Small Watersheds

Time of Concentration(T_c) or Travel Time (T_t)

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/16/2008
Condition:	Existing	Comments	Potential run-on to landfill		

Sheet Flow

	Segment ID		A		
1	Surface Description (Table 3-1)		Range (natural)		
2	Manning's Roughness Coefficient, n (Table 3-1)		0.13		
3	Flow Length, L (Total L≤ 300 ft)	ft	300		
4	2-year, 24-hr Ranifall, P2	in	1.15		
5	Land Slope	ft/ft	0.044		
6	Tt	hr	0.4267954		0.4267954

Shallow Concentrated Flow

	Segment ID		B		
7	Surface Description		Unpaved		
8	Flow Length, L	ft	4395.39		
9	Land Slope	ft/ft	0.0557		
10	Average Velocity, V (figure 3-1)		3.8		
11	Tt	hr	0.3213004		0.3213004

Channel Flow

	Segment ID		C		
	Flow Depth		1.2		
	Channel Side Slopes	?h:1V	3		
12	Cross Section flow area, a	ft^2	4.32		
13	Wetted Perimeter, Pw	ft	4.8		
14	Hydraulic Radius, r	ft	0.9		
15	Channel Slope, s	ft/ft	0.0235		
	Channel Material	Earth	0.02		
	Degree of Irregularity	Minor	0.005		
	Relative effect of Obstruction	Negligible	0		
	Vegetation	Low	0.0075		
	Degree of Meandering	Appreciable	1.15		
16	Manning's Roughness Coefficient, n		0.037375		
17	Velocity, V	ft/sec	5.6968398		
18	Flow Length, L	ft	2009.61		
19	T_t	hr	0.0979885		0.0979885
20	Watershed or Subarea T_c			hr	**0.8460844**

Graphical Peak Discharge Method

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/16/2008
Condition:	Existing	Comments:	Potential run-on to landfill		

1 Data

Drainage Area, Am	mi^2	0.13678125
Runoff curve number	CN	80
T_c	hr	0.846084381
Rainfall Distribution		II
Pond or Swamp Areas	% of Am	0.0

			Storm #1	Storm #2	Storm #3
2	Frequency	yr	25		
	Duration		24-hr		
3	Rainfall, P	in	1.9		
4	Initial Abstraction, I_a	in	0.5		
5	Compute I_a/P		0.263158		
	Tc	hr	0.846084		
6	Unit peak discharge, q_u	csm/in	350		
7	Runoff, Q	in	0.502564		
8	Pond and Swamp Factor, F_p		1		
9	Peak Discharge	ft^3/sec	24.05947		

Runoff Curve Number and Runoff

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Developed	Comments:	Area 1 Potential run-off from cap		

1. Runoff Curve Number

Soil Name and Hydrologic Soil Group	Cover Description	CN			Area (acres)	CNxArea
		Table 2-2	Table 2-3	Table 2-4		
C-clay loam or shallow s	newly graded areas (no vegetation)	86			6.69	575.34
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
				TOTALS: →	**6.69**	**575.34**

CN Weighted: $\frac{\Sigma(\text{CNxArea})}{\Sigma(\text{Area})} = \frac{575.34}{6.69} = 86$ **Use CN** → **86**

2. Runoff

		Storm #1		Storm #2		Storm #3	
		ARI (Year)	Duration	ARI (Year)	Duration	ARI (Year)	Duration
		25	24-hr				
Rainfall, P	in	1.9					
S	in	1.627907					
I_a	in	0.3255814					
Runoff (Q)	in	0.7740606					

Technical Release 55
Urban Hydrology for Small Watersheds

Time of Concentration(T_c) or Travel Time (T_t)

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Existing	Comments	Area 1 Potential run-off from cap		

Sheet Flow

		Segment ID	A		
1	Surface Description (Table 3-1)		Residue cover >20%		
2	Manning's Roughness Coefficient, n (Table 3-1)		0.17		
3	Flow Length, L (Total L≤ 300 ft)	ft	140		
4	2-year, 24-hr Ranifall, P2	in	1.15		
5	Land Slope	ft/ft	0.05		
6	Tt	hr	0.2731635		0.2731635

Shallow Concentrated Flow

		Segment ID	B		
7	Surface Description		Unpaved		
8	Flow Length, L	ft	166		
9	Land Slope	ft/ft	0.25		
10	Average Velocity, V (figure 3-1)		8		
11	Tt	hr	0.0057639		0.0057639

Channel Flow

		Segment ID	C		
	Flow Depth		0.58		
	Channel Side Slopes	?h:1V	2		
12	Cross Section flow area, a	ft^2	0.6728		
13	Wetted Perimeter, Pw	ft	2.0091789		
14	Hydraulic Radius, r	ft	0.3348632		
15	Channel Slope, s	ft/ft	0.286		
	Channel Material	Coarse Gravel	0.028		
	Degree of Irregularity	Moderate	0.01		
	Relative effect of Obstruction	Negligible	0		
	Vegetation	Low	0.0075		
	Degree of Meandering	Minor	1		
16	Manning's Roughness Coefficient, n		0.0455		
17	Velocity, V	ft/sec	8.4450612		
18	Flow Length, L	ft	240		
19	T_t	hr	0.0078942		0.0078942
20	Watershed or Subarea T_c			hr	**0.2868216**

Graphical Peak Discharge Method

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Existing	Comments:	Area 1 Potential run-off from cap		

1 Data

Drainage Area, Am	mi^2	0.010453125
Runoff curve number	CN	86
T_c	hr	0.286821559
Rainfall Distribution		II
Pond or Swamp Areas	% of Am	0.0

			Storm #1	Storm #2	Storm #3
2	Frequency	yr	25		
	Duration		24-hr		
3	Rainfall, P	in	1.9		
4	Initial Abstraction, I_a	in	0.325581		
5	Compute I_a/P		0.171359		
	Tc	hr	0.286822		
6	Unit peak discharge, q_u	csm/in	675		
7	Runoff, Q	in	0.774061		
8	Pond and Swamp Factor, F_p		1		
9	Peak Discharge	ft^3/sec	5.461662		

Runoff Curve Number and Runoff

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Developed	Comments:	Area 2 Potential run-off from cap		

1. Runoff Curve Number

Soil Name and Hydrologic Soil Group	Cover Description	CN Table 2-2	CN Table 2-3	CN Table 2-4	Area (acres)	CNxArea
C-clay loam or shallow s	newly graded areas (no vegetation)	86			8.8	756.8
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
				TOTALS: →	**8.8**	**756.8**

CN Weighted: $\frac{\Sigma(\text{CNxArea})}{\Sigma(\text{Area})} = \frac{756.8}{8.8} = 86$ **Use CN** → **86**

2. Runoff

		Storm #1		Storm #2		Storm #3	
		ARI (Year)	Duration	ARI (Year)	Duration	ARI (Year)	Duration
		25	24-hr				
Rainfall, P	in	1.9					
S	in	1.627907					
I_a	in	0.3255814					
Runoff (Q)	in	0.7740606					

Technical Release 55
Urban Hydrology for Small Watersheds

Time of Concentration(T_c) or Travel Time (T_t)

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Existing	Comments	Area 2 Potential run-off from cap		

Sheet Flow

	Segment ID	A		
1 Surface Description (Table 3-1)		Residue cover >20%		
2 Manning's Roughness Coefficient, n (Table 3-1)		0.17		
3 Flow Length, L (Total L≤ 300 ft)	ft	182		
4 2-year, 24-hr Ranifall, P2	in	1.15		
5 Land Slope	ft/ft	0.119		
6 Tt	hr	0.2382026		0.2382026

Shallow Concentrated Flow

	Segment ID	B		
7 Surface Description		Unpaved		
8 Flow Length, L	ft	0		
9 Land Slope	ft/ft	0.25		
10 Average Velocity, V (figure 3-1)		8		
11 Tt	hr	0		0

Channel Flow

	Segment ID	C		
Flow Depth		0.97		
Channel Side Slopes	?h:1V	2		
12 Cross Section flow area, a	ft^2	1.8818		
13 Wetted Perimeter, Pw	ft	3.3601786		
14 Hydraulic Radius, r	ft	0.5600298		
15 Channel Slope, s	ft/ft	0.0195		
Channel Material	Coarse Gravel	0.028		
Degree of Irregularity	Moderate	0.01		
Relative effect of Obstruction	Negligible	0		
Vegetation	Low	0.0075		
Degree of Meandering	Minor	1		
16 Manning's Roughness Coefficient, n		0.0455		
17 Velocity, V	ft/sec	3.1069404		
18 Flow Length, L	ft	1743		
19 T_t	hr	0.1558339		0.1558339
20 Watershed or Subarea T_c			hr	**0.3940366**

Graphical Peak Discharge Method

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Existing	Comments:	Area 2 Potential run-off from cap		

1 Data

Drainage Area, Am	mi^2	0.01375
Runoff curve number	CN	86
T_c	hr	0.394036558
Rainfall Distribution		II
Pond or Swamp Areas	% of Am	0.0

			Storm #1	Storm #2	Storm #3
2	Frequency	yr	25		
	Duration		24-hr		
3	Rainfall, P	in	1.9		
4	Initial Abstraction, I_a	in	0.325581		
5	Compute I_a/P		0.171359		
	Tc	hr	0.394037		
6	Unit peak discharge, q_u	csm/in	550		
7	Runoff, Q	in	0.774061		
8	Pond and Swamp Factor, F_p		1		
9	Peak Discharge	ft^3/sec	5.853833		

Technical Release 55
Urban Hydrology for Small Watersheds

Runoff Curve Number and Runoff

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Developed	Comments:	Area 3 Potential run-off from cap		

1. Runoff Curve Number

Soil Name and Hydrologic Soil Group	Cover Description	CN			Area (acres)	CNxArea
		Table 2-2	Table 2-3	Table 2-4		
C-clay loam or shallow s	newly graded areas (no vegetation)	86			5.38	462.68
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
				TOTALS: →	5.38	462.68

CN Weighted: $\frac{\Sigma(\text{CNxArea})}{\Sigma(\text{Area})} = \frac{462.68}{5.38} = 86$ **Use CN** → **86**

2. Runoff

		Storm #1		Storm #2		Storm #3	
		ARI (Year)	Duration	ARI (Year)	Duration	ARI (Year)	Duration
		25	24-hr				
Rainfall, P	in	1.9					
S	in	1.627907					
I_a	in	0.3255814					
Runoff (Q)	in	0.7740606					

Technical Release 55
Urban Hydrology for Small Watersheds

Time of Concentration(T_c) or Travel Time (T_t)

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Existing	Comments	Area 3 Potential run-off from cap		

Sheet Flow

		Segment ID	A		
1	Surface Description (Table 3-1)		Residue cover >20%		
2	Manning's Roughness Coefficient, n (Table 3-1)		0.17		
3	Flow Length, L (Total L≤ 300 ft)	ft	147		
4	2-year, 24-hr Ranifall, P2	in	1.15		
5	Land Slope	ft/ft	0.25		
6	Tt	hr	0.1492059		0.1492059

Shallow Concentrated Flow

		Segment ID	B		
7	Surface Description		Unpaved		
8	Flow Length, L	ft	0		
9	Land Slope	ft/ft	0.25		
10	Average Velocity, V (figure 3-1)		8		
11	Tt	hr	0		0

Channel Flow

		Segment ID	C		
	Flow Depth		0.867		
	Channel Side Slopes	?h:1V	2		
12	Cross Section flow area, a	ft^2	1.503378		
13	Wetted Perimeter, Pw	ft	3.0033761		
14	Hydraulic Radius, r	ft	0.5005627		
15	Channel Slope, s	ft/ft	0.02		
	Channel Material	Coarse Gravel	0.028		
	Degree of Irregularity	Moderate	0.01		
	Relative effect of Obstruction	Negligible	0		
	Vegetation	Low	0.0075		
	Degree of Meandering	Minor	1		
16	Manning's Roughness Coefficient, n		0.0455		
17	Velocity, V	ft/sec	2.9196369		
18	Flow Length, L	ft	1603		
19	T_t	hr	0.1525114		0.1525114
20	Watershed or Subarea T_c			hr	**0.3017173**

Graphical Peak Discharge Method

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Existing	Comments:	Area 3 Potential run-off from cap		

1 Data

Drainage Area, Am	mi^2	0.00840625
Runoff curve number	CN	86
T_c	hr	0.301717295
Rainfall Distribution		II
Pond or Swamp Areas	% of Am	0.0

			Storm #1	Storm #2	Storm #3
2	Frequency	yr	25		
	Duration		24-hr		
3	Rainfall, P	in	1.9		
4	Initial Abstraction, I_a	in	0.325581		
5	Compute I_a/P		0.171359		
	Tc	hr	0.301717		
6	Unit peak discharge, q_u	csm/in	675		
7	Runoff, Q	in	0.774061		
8	Pond and Swamp Factor, F_p		1		
9	Peak Discharge	ft^3/sec	4.392189		

Runoff Curve Number and Runoff

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Developed	Comments:	Area 4 Potential run-off from cap		

1. Runoff Curve Number

Soil Name and Hydrologic Soil Group	Cover Description	CN Table 2-2	CN Table 2-3	CN Table 2-4	Area (acres)	CNxArea
C-clay loam or shallow s	newly graded areas (no vegetation)	86			2.28	196.08
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
				TOTALS: →	2.28	196.08

CN Weighted: $\frac{\Sigma(\text{CNxArea})}{\Sigma(\text{Area})} = \frac{196.08}{2.28} = 86$ **Use CN** → **86**

2. Runoff

		Storm #1		Storm #2		Storm #3	
		ARI (Year)	Duration	ARI (Year)	Duration	ARI (Year)	Duration
		25	24-hr				
Rainfall, P	in	1.9					
S	in	1.627907					
I_a	in	0.3255814					
Runoff (Q)	in	0.7740606					

Technical Release 55
Urban Hydrology for Small Watersheds

Time of Concentration(T_c) or Travel Time (T_t)

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Existing	Comments	Area 4 Potential run-off from cap		

Sheet Flow

		Segment ID	A		
1	Surface Description (Table 3-1)		Residue cover >20%		
2	Manning's Roughness Coefficient, n (Table 3-1)		0.17		
3	Flow Length, L (Total L≤ 300 ft)	ft	76		
4	2-year, 24-hr Ranifall, P2	in	1.15		
5	Land Slope	ft/ft	0.25		
6	Tt	hr	0.0880204		0.0880204

Shallow Concentrated Flow

		Segment ID	B		
7	Surface Description		Unpaved		
8	Flow Length, L	ft	0		
9	Land Slope	ft/ft	0.25		
10	Average Velocity, V (figure 3-1)		8		
11	Tt	hr	0		0

Channel Flow

		Segment ID	C		
	Flow Depth		0.825		
	Channel Side Slopes	?h:1V	2		
12	Cross Section flow area, a	ft^2	1.36125		
13	Wetted Perimeter, Pw	ft	2.8578838		
14	Hydraulic Radius, r	ft	0.476314		
15	Channel Slope, s	ft/ft	0.0058		
	Channel Material	Coarse Gravel	0.028		
	Degree of Irregularity	Moderate	0.01		
	Relative effect of Obstruction	Negligible	0		
	Vegetation	Low	0.0075		
	Degree of Meandering	Minor	1		
16	Manning's Roughness Coefficient, n		0.0455		
17	Velocity, V	ft/sec	1.5210766		
18	Flow Length, L	ft	686		
19	T_t	hr	0.1252768		0.1252768
20	Watershed or Subarea T_c			hr	**0.2132971**

Graphical Peak Discharge Method

Project:	Neilson Construction Landfill	By:	JAH	Date:	4/11/2008
Location:	Emery County, UTAH	Checked:	BDM	Date:	4/15/2008
Condition:	Existing	Comments:	Area 4 Potential run-off from cap		

1 Data

Drainage Area, Am	mi^2	0.0035625
Runoff curve number	CN	86
T_c	hr	0.213297123
Rainfall Distribution		II
Pond or Swamp Areas	% of Am	0.0

			Storm #1	Storm #2	Storm #3
2	Frequency	yr	25		
	Duration		24-hr		
3	Rainfall, P	in	1.9		
4	Initial Abstraction, I_a	in	0.325581		
5	Compute I_a/P		0.171359		
	Tc	hr	0.213297		
6	Unit peak discharge, q_u	csm/in	750		
7	Runoff, Q	in	0.774061		
8	Pond and Swamp Factor, F_p		1		
9	Peak Discharge	ft^3/sec	2.068193		

LANDFILL CLOSURE COSTS

Section 1.0 - Engineering **General 4-Acre Area**

Total area to be covered is approximately 22 acres representing 6 closure events

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
1.1	Topographic Survey (1/6 of total cost)	LS	$2,500	1	$2,500
1.2	Boundary Survey for Closure (1/6 of total cost)	NA	$500	1	$500
1.3	Site Evaluation	NA	$85	8	$680
1.4	Development of Plans (Cover)	NA	$85	0	$0
1.5	Contract Administration - (Bidding and Award)	LS	$250	1	$250
1.6	Administrative Costs - (Certification of Final Cover and Closure Notice)	LS	$85	8	$680
1.7	Project Management - (Construction Observation and Testing)	LS	$4	60	$240
1.8	Monitor Well Consultant Cost	NA			$0
1.9	Other Environmental Permit Costs	NA			$0
				Engineering Subtotal	$4,850

Section 2.0 - Construction

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
2.1	**Final Cover System**				
2.1.1	*Site Preparation/ Site Regrading*	ACRE	$1,000	4.0	$4,000
2.1.2	*Gas Collection Layer Pipes*	NA			$0
2.1.3	*Low permeability Layer (Included in Erosion Protection Layer)*				
a	Soil Purchase	NA			$0
b	Soil Processing (load)	NA			$0
c	Soil Transportation	NA			$0
d	Soil Placement	NA			$0
e	Soil Amendment (compact)	NA			$0
2.1.4	*Low permeability Layer (Synthetic - If Applicable)*				
a	Geotextile	NA			$0
b	GCL	NA			$0
c	Geomembrane (HDPE,PVC,LLDPE,etc .)	NA			$0
2.1.5	*Drainage Layer (Soil - If Applicable)*				
a	Geotextile	NA			$0
b	Sand/Gravel	NA			$0
2.1.6	*Drainage Layer (Synthetic - If Applicable)*				
a	Geotextile	NA			$0
b	Geonet/Geocomposite	NA			$0
2.1.7	*Erosion Protection Soil Layer*				
a	Soil Purchase	NA			$0
b	Soil Processing (load)	CY	$0.50	9,680	$4,840
c	Soil Transportation	CY	$0.50	9,680	$4,840
d	Soil Placement	CY	$0.75	9,680	$7,260
e	Soil Amendment (compact)	CY		0	$0
2.1.8	*Topsoil Layer*				
a	Soil Purchase	NA			$0
b	Soil Processing (load)	CY	$0.50	3,226	$1,613
c	Soil Transportation	CY	$0.50	3,226	$1,613
d	Soil Placement	CY	$0.75	3,226	$2,420
e	Soil Amendment	NA			$0
2.1.9	*Revegetation*				
a	Seeding	ACRE	$400	4.0	$1,600
b	Fertilizing	ACRE	$400	4.0	$1,600
c	Mulch	ACRE	$100	4.0	$400
d	Tacifier	ACRE	$100	4.0	$400
2.2	**Stormwater Protection Structures**				
a	Culverts	NA			$0
b	Pipes	NA			$0
c	Ditches/Berms	NA			$0
d	Detention Basins	NA			$0
2.3	**Gas Collection System**				
a	Design	NA			$0
b	Addtional Gas Collection Wells and Connection	NA			$0
c	THOX Unit - (Optional)	NA			$0
2.4	**Leachate Collection System**				
a	Design	NA			$0
b	Additional Equipment / Installation	NA			$0
2.5	**Groundwater Monitoring System**				
a	Monitor Well Installation	NA			$0
b	Monitor Well Abandonment	NA			$0
2.6	**Site Security**				
a	Lighting, signs, etc.	NA			$0
b	Fencing and Gates	NA			$0
2.7	**Miscellaneous**				
a	Performance Bonds	LS	$3,000	1	$3,000
b	Contract/Legal fees	LS	$3,000	1	$3,000
2.8	**Other Site Waste Areas**				
a	Dead Animal Area	NA			$0
b	Asbestos Cell	NA			$0
c	Misc. Site Waste Areas	NA			$0
				Construction Subtotal	$36,586

LS - LUMP SUM
NA - NOT APPLICABLE
EA - EACH
CY - CUBIC YARD
FT - FEET
ALL - ALLOWANCE

Total	$41,436
10% Contingency	$4,144
Subtotal Closure Cost	$45,579

LANDFILL POST-CLOSURE COSTS (30 YEARS)

Section 1.0 - Engineering

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
1.1	**Post-Closure Plan**	NA			$0
1.2	**Annual Report** (including results from gas, leachate, and ground water sampling - details of maintenance performed)	EA	$100	30	$3,000
a	Semiannual Site Inspections	EA	$200	60	$12,000
b	Plan Update	NA			$0
				Engineering Subtotal	$15,000

Section 2.0 - Gas Collection System - Sampling

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
2.1	**Sample Collection**	NA			$0
2.2	**Sample Analysis**	NA			$0
2.3	**Report** (Part of Annual Report)	NA			
				Gas Collection System - Sampling Subtotal	$0

Section 3.0 - Leachate Collection System - Sampling

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
2.1	**Sample Collection**	NA			$0
2.2	**Sample Analysis**	NA			$0
2.3	**Report** (Part of Annual Report)				
				Leachate Collection System - Sampling Subtotal	$0

Section 4.0 - Ground Water Monitoring System - Sampling

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
3.1	**Sample Collection**	NA			$0
3.2	**Sample Analysis**	NA			$0
3.3	**Report** (Part of Annual Report)				
				Ground Water Collection System - Sampling Subtotal	$0

Section 5.0 - Facility Operations and Maintenance

Item	Description	Unit Measure	Cost/Unit	No. Units	Total Cost
4.1	**Cover**				
a	Soil Replacement	LS	$250	30	$7,500
b	Vegetation/Reseeding	LS	$100	30	$3,000
4.2	**Storm Water Protection Structures**				
a	Ditch and Culvert Maintenance	LS	$100	30	$3,000
b	Berm and Basin Maintenance	LS	$100	30	$3,000
4.3	**Gas Collection System**				
a	System Operation	NA			$0
b	System Repair	NA			$0
4.4	**Leachate Collection System**				
a	System Operation	NA			$0
b	System Repair	NA			$0
4.5	**Ground Water Monitoring System**				
a	System Operation	NA			$0
b	System Repair	NA			$0
4.6	**Site Security**				
a	Lighting, signs, etc...	LS	$100	30	$3,000
b	Fencing and Gates	LS	$100	30	$3,000
4.7	**Miscellaneous**				
a	Animal pit, asbestos cell, etc...	NA			$0
b					
				Facility Operations and Maintenance Subtotal	$22,500

Total	$37,500
10% Contingency	$3,750
Total Post-Closure Cost	$41,250